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Acronis® Disk Director® 11 Home

User's Guide

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Table of contents

1 Introducing Acronis® Disk Director® 11 Home 5

2 Installation and upgrade 7

2.1 Hardware requirements 7

2.2 Supported operating systems 7

2.3 Supported file systems 7

2.4 Supported media 8

2.5 Installing Acronis Disk Director 8

2.6 Installing Acronis OS Selector 8

2.7 Updating Acronis Disk Director 9

2.8 Removing Acronis Disk Director 9

2.9 Upgrading Acronis Disk Director 9

2.10 Demo version information 9

2.11 Technical Support 10

3 Basic concepts 11

3.1 Basic and dynamic disks 11

3.2 Types of basic volumes 11

3.3 Types of dynamic volumes 12

3.4 Active, system, and boot volumes 13

3.5 Dynamic volume types support 13

3.6 Volume alignment in disks with a 4-KB sector size 14

4 Getting started 16

4.1 Precautions 16

4.2 User privileges 16

4.3 Running Acronis Disk Director 16

4.4 Acronis Disk Director main window 17

4.5 Disk and volume information 18

4.5.1 Disk statuses 18

4.5.2 Volume statuses 19

4.6 Disk layout 19

4.7 Performing operations 20

4.7.1 Pending operations 20

4.7.2 Undoing pending operations 21

4.8 Log 21

4.8.1 Actions on log entries 21

4.8.2 Filtering and sorting log entries 22

4.9 Collecting system information 23

4.10 How to 23

5 Volume operations 25
5.1 Creating a volume 25
5.2 Resizing a volume 27
5.3 Copying a volume 28
5.4 Moving a volume 28
5.5 Merging basic volumes 30
5.6 Formatting a volume 30
5.7 Deleting a volume 31
5.8 Splitting a basic volume 31
5.9 Changing a volume label 32
5.10 Changing a drive letter 33
5.11 Converting a primary volume to logical 33
5.12 Converting a logical volume to primary 34
5.13 Changing a partition type 34
5.14 Setting a volume active 35
5.15 Adding a mirror 35
5.16 Removing a mirror 36
5.17 Breaking a mirrored volume 36
5.18 Browsing a volume's content 37
5.19 Checking a volume for errors 37
5.20 Defragmenting a volume 37
5.21 Changing a cluster size 38
5.22 Changing a file system 38
5.23 Hiding a volume 39
5.24 Unhiding a volume 39
5.25 Specifying i-node density 40
6 Disk operations 41
6.1 Disk initialization 41
6.2 Basic disk cloning 41
6.3 Disk conversion: MBR to GPT 43
6.4 Disk conversion: GPT to MBR 44
6.5 Disk conversion: basic to dynamic 44
6.6 Disk conversion: dynamic to basic 45
6.7 Changing a disk status: online to offline 46
6.8 Changing a disk status: offline to online 46
6.9 Importing foreign disks 47
6.10 Removing a missing disk 47
6.11 Cleaning up a disk 48

7 Tools 49
7.1 Acronis Bootable Media Builder 49
7.1.1 How to create bootable media 50
7.1.2 Working under bootable media 54
7.2 Acronis Recovery Expert 56
8 Acronis OS Selector 58
8.1.1 Starting the work 58
8.1.2 Setting the boot menu 59
8.1.3 Operations 59
8.1.4 Editing operating systems 63
8.1.5 Detecting operating systems 65
8.1.6 Setting Acronis OS Selector options 65
8.1.7 Installing and using several operating systems on a single machine 67
8.2 Acronis Disk Editor 73
8.2.1 Starting work with Acronis Disk Editor 73
8.2.2 Main window, menu and controls 74
8.2.3 Editing disks 74
8.2.4 View 75
8.2.5 Search 76
8.2.6 Usage examples 76
9 Glossary 81

1 Introducing Acronis® Disk Director® 11 Home

Acronis® Disk Director® 11 is a powerful and easy-to-use tool for managing disks and volumes. With a comprehensive set of operations, you can organize your hard disk and volume configuration for optimal performance, while keeping your data safe.

Key features

Acronis Disk Director offers many features including:

- **Create both basic and dynamic volumes**

  The handy Create Volume wizard has been improved to support dynamic volumes creation. Now, in addition to basic volumes, you can easily create dynamic volumes in Acronis Disk Director to:

  - Increase the volume size beyond the capacity of a single disk, by using a spanned volume
  - Reduce access time to files, by using a striped volume
  - Achieve fault tolerance, by using a mirrored volume *

- **Add, remove, or break mirrored volumes** *

  Make your basic or simple volume fault-tolerant in just one action by adding a mirror. If you need extra unallocated space on a disk containing one of the mirrors—remove a mirror. Break a mirrored volume to get two independent simple volumes with initially identical content.

- **Copy or move a volume of one type as a volume of another type**

  Change the type of a volume when copying or moving it. For example, you can copy the contents of a mirrored volume to a spanned volume.

- **Convert primary volumes to logical and vice versa**

  Convert a primary volume to logical to create a fifth volume on a disk that currently has four primary volumes.

- **Convert basic disks to dynamic and vice versa**

  Convert the existing basic disks to dynamic to achieve additional disk reliability for data storage.

- **Convert GPT disks to MBR and vice versa**

  Change the partitioning scheme of your disk the way you need it.

- **Import foreign disks**

  Make dynamic disks added from another machine accessible for the system.

- **Changing a disk status: online to offline and vice versa** *

  Change a disk status to offline in order to protect it from unintentional use.

- **Disk cloning**

  The Disk Cloning wizard lets you replace the old basic MBR disk with a new one without reinstalling operating systems and applications. It transfers all the source disk data to a target disk. The source disk volumes can be cloned to the target disk "as is", or resized automatically with respect to the target disk size.

- **Disk and volume management operations**

  Experience the vast array of disk and volume management operations:

  - Resize, move, copy, split and merge volumes without data loss or destruction
  - Format and label volumes, assign volume letters, and set volumes active
  - Initialize newly added hard disks

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- Delete volumes
- **New!** Change file systems
- **New!** Clean up disks
- **New!** Hide/unhide volumes
- **New!** Specify i-node density
- **New!** Change a cluster size
- Explore volume data, even on Linux volumes before performing operations
- Preview changes made in disk and volume layout before applying them
- Browse through the detailed information about all hard disks, volumes and file systems

- **Acronis Recovery Expert**

  Helps you to recover accidentally lost or deleted volumes on basic MBR disks.

- **Acronis Bootable Media Builder**

  Now, you can create bootable media based both on WinPE and Linux to use Acronis Disk Director on bare metal or outside of an operating system.

- **Acronis OS Selector**

  Easy-to-use boot manager that allows several operating systems on a single machine and lets you create different configurations for any installed operating system, including Windows 7.

- **New! Acronis Disk Editor**

  A professional tool that performs a variety of actions on a hard disk.

- **Log**

  Examine information about disk and volume operations, including reasons for failure, if any.

** For the operating systems that support such functionality.*

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2 Installation and upgrade

This section answers questions that might arise before the product installation and guides you through the installation and upgrade of Acronis Disk Director.

In this section

Hardware requirements....7
Supported operating systems....7
Supported file systems....7
Supported media....8
Installing Acronis Disk Director....8
Installing Acronis OS Selector....8
Updating Acronis Disk Director....9
Removing Acronis Disk Director....9
Upgrading Acronis Disk Director....9
Demo version information....9
Technical Support....10

2.1 Hardware requirements

The table below lists the minimum and recommended hardware requirements to install and run Acronis Disk Director.

Item	Minimum requirements	Recommended
Boot firmware	BIOS-based*	
Computer processor	Modern processor, 800 MHz or faster	1 GHz 32-bit (x86) or 64-bit (x64) processor
System memory	256 MB	512 MB or more
Screen resolution	800*600 pixels	1024*768 pixels or higher
Installation disk space	150 MB	
Other hardware	A mouse	A CD/DVD recording drive, or a flash drive for bootable media creation

* Machines that are based on Extensible Firmware Interface (EFI) are not supported.

2.2 Supported operating systems

The following operating systems are supported by Acronis Disk Director:

- Windows XP - all editions
- Windows Vista - all editions
- Windows 7 - all editions

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2.3 Supported file systems

Acronis Disk Director supports the following file systems for performing operations:

- FAT16
- FAT32
- NTFS
- Ext2
- Ext3
- Reiser3
- Linux SWAP

The operations resulting in a change of volume size—that is: Create (p. 25), Resize (p. 27), Copy (p. 28), Move (p. 28), Merge (p. 30), Split (p. 31)—are not available for the XFS, Reiser4, HPFS and JFS file systems.

2.4 Supported media

- Hard disk drives (HDD) and solid-state drives (SSD)
- Support for IDE, SCSI and SATA interfaces
- CD-R/RW, DVD-R/RW, DVD+R (including double-layer DVD+R), DVD+RW, DVD-RAM, BD-R, BD-RE for bootable media creation*
- USB 1.1 / 2.0 / 3.0, FireWire (IEEE-1394) hard disk drives
- PC card storage devices

* Burned rewritable discs cannot be read in Linux without a kernel patch.

2.5 Installing Acronis Disk Director

To install Acronis Disk Director 11

1. If you have the previous version of Acronis Disk Director, remove it before proceeding with the installation of Acronis Disk Director 11.
2. Run the setup file of Acronis Disk Director 11.
3. Click **Install Acronis Disk Director**.
4. Accept the terms of the license agreement.
5. Type in your license key. Skip this step if you want to evaluate the demo product version (p. 9).
6. Select whether you want to install the program for all users on this machine, or for the current user only.
7. Proceed with installation.

2.6 Installing Acronis OS Selector

To install Acronis OS Selector, you need to first install Acronis Disk Director (p. 8). Then select **Start** -> **All Programs** -> **Acronis** -> **Disk Director** -> **Install Acronis OS Selector** and follow the setup program instructions. If you already have Acronis OS Selector installed on your machine, it will be replaced by the new version.

Acronis OS Selector can be installed on volumes of basic MBR disks only.

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During the installation of Acronis OS Selector, the hidden system folder BOOTWIZ will be created on your machine to keep the program loader. Acronis OS Selector will also copy operating system files found on your machine into this folder to avoid problems during the booting process and to simplify adding a new operating system in the future.

Acronis OS Selector can be installed in the **Typical** or **Custom** mode.

During **Typical** installation, the BOOTWIZ folder will be created in the system hard disk volume that contains the Windows files and folders.

Using the **Custom** installation option, you will be able to select the location of the BOOTWIZ folder. This might come in handy when a system volume is accidentally destroyed or damaged. In that case, you will be able to access the Acronis OS Selector boot menu even if the system volume is unavailable.

2.7 Updating Acronis Disk Director

To update Acronis Disk Director 11

1. Download the latest product update from the official Acronis web site.
2. Run the Acronis Disk Director setup file.
3. Click **Update/Remove Acronis Disk Director**.
4. Select **Update**.
5. Proceed with the update.

2.8 Removing Acronis Disk Director

To remove Acronis Disk Director

1. Depending on the operating system running, do either of the following:
   - for operating systems starting from Windows Vista – select **Start** -> **Computer** -> **Uninstall or change a program**, then select **Acronis Disk Director** and click **Uninstall**.
   - for operating systems older than Windows Vista – select **Control Panel** -> **Add or remove programs**, then select **Acronis Disk Director** and click **Remove**.
2. Follow the instructions on the screen. Acronis Disk Director will be completely removed along with Acronis OS Selector.

To remove Acronis OS Selector only, select **Start** -> **All Programs** -> **Acronis** -> **Disk Director** -> **Install Acronis OS Selector**. Then select **Uninstall Acronis OS Selector** in the installation program window and follow the program instructions.

2.9 Upgrading Acronis Disk Director

Before proceeding with the upgrade, make sure that you have the license key for Acronis Disk Director.

Upgrading from Acronis Disk Director 10

If you already have Disk Director 10 installed and want to upgrade it to Acronis Disk Director 11:

1. Remove Acronis Disk Director 10 from your machine.
2. Follow the on-screen instructions as described in Installing Acronis Disk Director (p. 8).

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Upgrading from the demo version of Acronis Disk Director 11

If you already have the demo version (p. 9) of Acronis Disk Director 11 installed and want to upgrade it to a full version:

1. Run Acronis Disk Director.
2. Select **Help > Enter license key** from the top menu, and then type in your license key for Acronis Disk Director.

2.10 Demo version information

The demo version of Acronis Disk Director is fully functional, except for the following limitations:

- All volume operations can be performed on volumes whose initial and resulting size is not larger than 100 MB. Operations on volumes whose size is larger than 100 MB cannot be committed.
- The following disk operations can be committed only if the total size of all volumes on the disk is not larger than 100 MB:
  - MBR to GPT (p. 43) and vice versa (p. 44) disk conversion.
  - Basic to dynamic (p. 44) and vice versa (p. 45) disk conversion.
  - Clone basic disk (p. 41).

2.11 Technical Support

Maintenance and Support Program

If you need assistance with your Acronis product, please go to http://www.acronis.com/support/

Product Updates

You can download the latest updates for all your registered Acronis software products from our website at any time after logging into your **Account** (https://www.acronis.com/my) and registering the product. See **Registering Acronis Products at the Website** (http://kb.acronis.com/content/4834) and **Acronis Website User Guide** (http://kb.acronis.com/content/8128).

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3 Basic concepts

This section gives you a clear understanding of basic and dynamic disks and volume types.

After reading this section, you will know the advantages and limitations of each possible volume configuration. In addition, you will be able to decide what types of disks and volumes best suit your needs for organizing data storage.

In this section

Basic and dynamic disks 11
Types of basic volumes 11
Types of dynamic volumes 12
Active, system, and boot volumes 13
Dynamic volume types support 13
Volume alignment in disks with a 4-KB sector size 14

3.1 Basic and dynamic disks

Each disk on your machine can be one of two types: basic or dynamic.

Basic disks

This is the type of disk that most computers originally have.

Basic disks can normally be used by any operating system, including any version of Windows.

A basic disk can store one or more volumes—called basic volumes. A basic volume cannot occupy more than one disk.

When to use basic disks:

- On a machine that has only one hard disk drive
- On a machine that runs an older Windows operating system, or an operating system other than Windows

By using Acronis Disk Director, you can convert a basic disk to a dynamic disk (p. 44).

Dynamic disks

These disks provide a greater functionality as compared to basic disks.

Dynamic disks can be used only by the Windows operating systems starting with Windows 2000.

A dynamic disk can store one or more volumes—called dynamic volumes. Unlike a basic volume, a dynamic volume can occupy more than one disk.

When to use dynamic disks. Dynamic disks are most effective if your machine has more than one hard disk drive. In this case, you can:

- Create a large volume that occupies several disks.
- Add fault-tolerance to your system and data, by mirroring a volume—such as the one with the operating system—to another disk. If a disk with one of these mirrors fails, no data will be lost on such volume.

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By using Acronis Disk Director, you can convert a dynamic disk to a basic disk (p. 45). You may need to do so, for example, to install an operating system other than Windows on that disk.

Converting a dynamic disk to basic may require deleting some volumes on it, such as volumes that occupy more than one disk.

3.2 Types of basic volumes

A basic disk can store two types of volumes: primary volumes and logical volumes.

The main difference between a primary volume and a logical volume is that a primary volume can be used as the system or active volume—that is, a volume from which the machine or its Windows operating systems start.

On each basic GPT (p. 87) disk, you can create up to 128 primary volumes. The maximum volume size on a GPT disk is 16 exabytes.

Unlike basic GPT disks, on each basic MBR (p. 88) disk, you can create either up to four primary volumes, or up to three primary volumes plus an unlimited number of logical volumes. The maximum volume size on an MBR disk is 2 terabytes.

If you are not planning to use more than four volumes on the disk, all volumes can be primary volumes. Otherwise, you can leave the active volume and the system volume as primary volumes, and then create as many logical volumes as required.

If the disk already has four primary volumes and you need to create a fifth volume, first convert one of the volumes—but not the system or active volume—to a logical volume, as described in Converting a primary volume to logical (p. 33), and then create a new logical volume.

3.3 Types of dynamic volumes

The following are the types of dynamic volumes that are supported by Acronis Disk Director—provided that they are supported by the operating system, as shown in Dynamic volume types support (p. 13).

Simple volume

A volume (p. 92) that consists of disk space from a single dynamic disk (p. 84).

Physically, a simple volume can occupy more than one region of disk space, which can be logically perceived as a single contiguous region.

When you extend a simple volume to another disk, the volume becomes a spanned volume (p. 90). When you add a mirror to a simple volume, the volume becomes a mirrored volume (p. 88).

Spanned volume

A volume that consists of disk space from two or more dynamic disks (p. 84), in portions that do not need to be equally-sized.

A spanned volume can reside on up to 32 disks.

Unlike mirrored (p. 88) and RAID-5 volumes, spanned volumes are not fault-tolerant. Unlike striped volumes (p. 91), spanned volumes do not provide faster data access.

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Striped volume

A volume that resides on two or more dynamic disks and whose data is evenly distributed across equally-sized portions of disk space (called stripes) on those disks.

Access to data on striped volumes is usually faster than on other types of dynamic volumes, because it can be performed simultaneously on multiple hard disks.

Unlike a mirrored volume (p. 88), a striped volume does not contain redundant information, so it is not fault-tolerant.

A striped volume is also known as a RAID-0 volume.

Mirrored volume

A fault-tolerant volume whose data is duplicated on two physical disks (p. 90).

Each of the two parts of a mirrored volume is called a mirror.

All of the data on one disk is copied to another disk to provide data redundancy. If one of the hard disks fails, the data can still be accessed from the remaining hard disks.

Volumes that can be mirrored include the system volume (p. 91) and a boot volume (p. 82).

A mirrored volume is sometimes called a RAID-1 volume.

Note: *No redundancy provided by the dynamic volumes architecture can replace the proper backup procedure. If you want to be sure of the safety of your data, the best policy is to combine both precautions.*

3.4 Active, system, and boot volumes

Some volumes on the disks of your machine contain information that is necessary for the machine to start and for a particular operating system to run. Each such volume is called active, system, or boot, depending on its function.

If only one Windows operating system is installed on your machine, a single volume is often the active, system, and boot volume at the same time.

Because of their special role, you should use extra caution when performing operations with these volumes. Some operations with these volumes have limitations as compared to ordinary volumes.

Active volume

This is the volume from which the machine starts after you switch it on.

The active volume usually contains one of the following programs:

- The operating system
- A program that enables you to choose which operating system to run (if more than one is installed), such as GRUB
- A diagnostic or recovery tool that runs before the operating system, such as Acronis Startup Recovery Manager

In Acronis Disk Director, the active volume is marked with a flag-like icon:

If you choose to run a Windows operating system, the start process continues from the volume known as the system volume.

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System volume

This is the volume from which any of the installed Windows operating systems starts—even if more than one is installed.

The system volume contains files that are necessary to start Windows, such as boot.ini and Ntldr.

There is always one system volume, whereas each of the installed Windows operating systems usually stores its files on its own volume, called a boot volume.

Boot volume

This is the volume on which the files of a particular Windows operating system are stored.

A boot volume contains folders such as the Program Files folder and the Windows folder.

Note: *The notions of system volume and boot volume apply only to Windows operating systems.*

3.5 Dynamic volume types support

The table below lists the operating systems that support certain dynamic volume types.

	Simple	Spanned	Striped	Mirrored
Windows XP Home	-	-	-	-
Windows XP Professional	+	+	+	-
Windows XP Professional x64	+	+	+	-
Windows Vista Home Basic	+	+	+	-
Windows Vista Home Premium	+	+	+	-
Windows Vista Business	+	+	+	-
Windows Vista Ultimate	+	+	+	-
Windows 7 Starter	+	+	+	-
Windows 7 Home Premium	+	+	+	-
Windows 7 Professional	+	+	+	+
Windows 7 Ultimate	+	+	+	+

3.6 Volume alignment in disks with a 4-KB sector size

When a new volume is created, its beginning is aligned with the disk's physical sector boundaries.

It ensures that each file system allocation unit (cluster) on the volume starts and ends on the boundaries of the disk's physical sectors. If the volume clusters are aligned with sectors, this volume and all following volumes are also aligned. If clusters are not aligned with sectors, the volumes are misaligned. Misalignment decreases the overall system performance and hardware lifetime.

When misalignment occurs

Volume misalignment occurs when you create a volume on a modern HDD or SSD drive that has a 4-KB sector size using a Windows operating systems earlier than Vista.

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What is the cause of misalignment

All Windows operating systems earlier than Vista use a factor of 512 bytes to create volume clusters. The volume start is aligned to 512-byte sectors. Also, these operating systems use the Cylinder/Head/Sector (CHS) addressing scheme. Volumes created with this scheme are aligned by cylinders/tracks of the disk.

Usually, a track consists of 63 physical sectors. Since the first track is reserved for the master boot record (MBR) and other service purposes, the first volume starts from the beginning of the second track of the disk. Therefore, volumes aligned by 63 sectors are not aligned with 4-KB sectors: 63 sectors by 512 bytes do not match with the integer number of 4-KB sectors.

Thus, the first created volume and all of the following volumes on the hard disk drive will be misaligned.

Why misalignment is an important issue for hard disk drives

When a single bit of data is changed, the operating system entirely overwrites the cluster that contains the changed data. But if misalignment occurs, the cluster will overlap more physical sectors than it would have occupied if aligned. As a result, more physical sectors need to be erased and rewritten each time data changes.

The redundant read/write operations noticeably slow down the disk speed and overall system performance.

The same is true for SSD drives that have a 4-KB or larger sector (memory page) size. For SSD drives misalignment decreases not only system performance, but also drive lifetime. SSD memory cells are designed for a certain amount of read/write operations. Therefore, redundant read/write operations lead to early degradation of the SSD drive.

How to avoid volume misalignment

The latest operating systems, starting from Windows Vista, already support the new sector size. Thus, volumes created with these operating systems will be properly aligned.

Many hard disk drive manufacturers supply their modern drives with controllers that can shift addressing offset to one sector (63 sector becomes 64 sector), so volumes will appear aligned.

How to work with 4-KB sector size disks using Acronis Disk Director

Suppose that you added a new 4-KB sector size hard disk drive with to a machine that is running Windows XP only. There are no volumes on this drive yet. If you start creating volumes on this disk using Windows XP, you may experience some slowdown of the system performance while accessing the disk. To ensure proper volume alignment and normal access to volumes on this disk, perform the following steps:

1. Create a bootable media with Acronis Disk Director—see How to create bootable media (p. 50).
2. Run Acronis Disk Director from a bootable media—see Running Acronis Disk Director (p. 16).
3. Select the **Bootable media OS** disk layout—see Disk layout (p. 19).
4. Create volumes—see Creating a volume (p. 25).

If Windows 7 or Windows Vista is installed in addition to Windows XP, select the disk layout of either of those operating systems.

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After the volumes are created, you can perform other operations with them (including changing their size) under any disk layout.

How to fix volume misalignment using Acronis Disk Director

Suppose that you have already created basic volumes on a disk with a 4-KB sector size, using Windows XP. Volumes already contain data. To align the misaligned volumes on the disk using Acronis Disk Director, clone this disk to another and then clone it back—see Disk cloning (p. 41). After cloning, Acronis Disk Director shifts the first volume start with 1MB offset, all the disk volumes will be aligned properly.

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4 Getting started

After reading this section, you will know how to run and use Acronis Disk Director, what precautions you should take, and how to perform the most common tasks you might need.

In this section

Precautions 16
User privileges....16
Running Acronis Disk Director 16
Acronis Disk Director main window....17
Disk and volume information....18
Disk layout....19
Performing operations....20
Log....21
Collecting system information 23
How to....23

4.1 Precautions

To avoid any possible disk and volume structure damage or data loss, please take all necessary precautions and follow these simple rules:

1. Back up the disk whose volumes will be created or managed. Having your most important data backed up to another hard disk or CD will allow you to work on disk volumes being reassured that your data is safe.

   Acronis has an extremely effective comprehensive data backup and recovery solution — Acronis True Image. It creates a data or disk backup copy stored in a compressed archive file that can be restored in case of an accident.

2. Check volumes (p. 37) to make sure they are fully functional and do not contain any bad sectors or file system errors.
3. Do not perform any disk/volume operations while running other software that has low-level disk access. Acronis Disk Director must obtain exclusive access to the target disk/volume. This means no other disk management utilities (such as the Windows Disk Management utility) can access it at that time. If you receive a message stating that the disk/volume cannot be blocked, close the disk management applications that use this disk/volume and start again. If you cannot determine which applications use the disk/volume, close them all.

With these simple precautions, you will protect yourself against accidental data loss.

4.2 User privileges

In order to perform any operation using Acronis Disk Director, you must be logged on as a member of the **Administrators** group.

4.3 Running Acronis Disk Director

Running Acronis Disk Director in Windows

1. Select **Start** -> **All Programs** -> **Acronis** -> **Disk Director** -> **Acronis Disk Director**.

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2. In the disk management area, examine the current layout of disks and volumes.
3. Add one or more management operations on disks and volumes to the queue of pending operations. These operations will take effect only after you commit them.
4. In the disk management area, examine how the layout of disks and volumes will look when the pending operations are completed.
5. Commit the pending operations.

Some operations, such as changing the size of a volume from which Windows starts, may require restarting the machine.

Running Acronis Disk Director from a bootable media

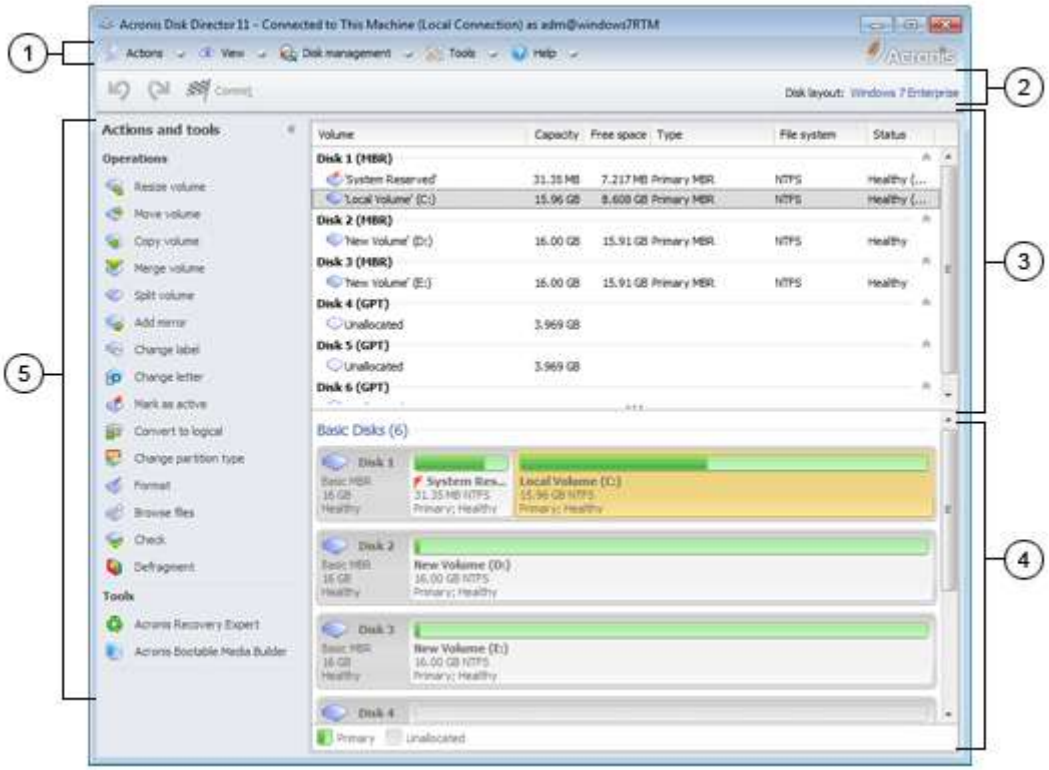
Acronis Disk Director has a bootable version that can be run on a bare metal system, or on a crashed machine that cannot boot normally, or even on a non-Windows system, like Linux. A bootable version of Acronis Disk Director is created with Acronis Bootable Media Builder (p. 49).

To run Acronis Disk Director, boot the machine from a bootable media, and then select **Acronis Disk Director**.

While working under bootable media (p. 54), Acronis Disk Director can perform almost all the operations on any disks and volumes that can be performed under Windows.

4.4 Acronis Disk Director main window

The main window of Acronis Disk Director is your main working place with the product.



The main window of Acronis Disk Director

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1. Menu

The menu provides access to all the actions, tools and settings of Acronis Disk Director.

2. Toolbar

The toolbar displays the current disk layout (p. 19) and lets you perform the following actions on pending operations: Commit (p. 20), Undo and Redo (p. 21).

Disk Management view

The disk management area contains the table of disks and volumes and the graphical panel.

3. Table

The table lists all the disks and their volumes and lets you select any of them to perform operations.

You can sort volumes by columns. Click the column's header to sort the volumes in ascending order. Click it once again to sort the volumes in descending order.

If required, you can hide the shown columns and show the hidden ones.

To show or hide columns

1. Right-click any column header to open the context menu. The menu items that are ticked off correspond to the column headers presented in the table.
2. Click the items you want to be displayed/hidden.

4. Graphical panel

The graphical panel provides visual information about all the disks and their volumes for better understanding of the volume configuration. The graphical panel also lets you select both the volumes and disks to perform operations on them.

5. Actions and tools pane

Provides quick access to the operations that can be performed on the selected disk or volume (see Volume operations (p. 25) and Disk operations (p. 41)) and Acronis tools (see Tools (p. 49)).

4.5 Disk and volume information

In the table and graphical panel—along with the type, size, letter, partitioning scheme, and other information about disks and volumes—you can also check their status. The status helps you to estimate the condition of a disk or volume.

4.5.1 Disk statuses

Check the disk status to estimate whether the disk is functioning without problems. Disk statuses are displayed in the graphical panel below their capacity.

Here are brief descriptions of the most common disk statuses:

- **Online**

  A basic or dynamic disk is accessible and functioning correctly. This is the normal disk status. You can change an online disk to offline—see Changing a disk status: online to offline (p. 46).
- **Online (Errors)**

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I/O errors are found on a dynamic disk. If a disk has errors, we recommended you to repair it as soon as possible to avoid data loss.

- **Offline**

  A dynamic disk is accessible in read only mode (if you switched it to offline previously), or not accessible at all (corrupted or intermittently unavailable). You can make the disk that you previously switched to offline, fully accessible—see Changing a disk status: offline to online (p. 46).

- **Foreign**

  This status occurs when you move a dynamic disk to your machine from another computer. To access data on foreign disks, you have to add these disks to your machine's system configuration—see Importing foreign disks (p. 47), or convert them to basic disks—see Disk conversion: dynamic to basic (p. 45).

- **Missing**

  A dynamic disk is corrupted, powered down, or disconnected.

- **Not Initialized**

  A disk does not contain a valid signature. After you install a new disk, the disk must be registered in the operating system—see Disk initialization (p. 41). Only then, you can create volumes on that disk.

To find out more information about disk statuses, please refer to the *Disk status descriptions* article on the Microsoft website.

Important! *For instructions explaining how to repair disks with an* ***Online (Errors)****,* ***Offline****, or* ***Missing*** *status, please refer to the* Troubleshooting Disk Management *article on the Microsoft website.*

4.5.2 Volume statuses

Check a volume status to make sure the volume is accessible and works without problems. Volume statuses appear both in the table and graphical panel.

Here are brief descriptions of the most common volume statuses:

- **Healthy**

  A basic or dynamic volume is accessible and functioning correctly. This is the normal volume status.

  The **Healthy** status often has a number of substatuses that are displayed in the table view (in parentheses) and in the graphical view (below the volume size and separated by a semicolon). The **System**, **Boot** and **Active** substatuses are the most common and described in the Active, system, and boot volumes (p. 13) section.

  The healthy volume whose file system is corrupted is marked with the following icon:

- **Failed**

  A dynamic volume (striped, or spanned) cannot be started automatically, or one of the underlying disks is missing.

- **Failed Redundancy**

  The data on a mirrored volume is no longer fault tolerant because one of the dynamic disks is not online. You can access the volume until the remaining dynamic disk is online. To avoid data loss, we recommend you to repair the volume as soon as possible.

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To find out more information about disk statuses, please refer to the *Volume status descriptions* article on the Microsoft website.

Important! *For instructions explaining how to repair volumes with erroneous statuses, please refer to the* Troubleshooting Disk Management *article on the Microsoft website.*

4.6 Disk layout

On a machine with two or more operating systems, representation of disks and volumes depends on which operating system is currently running.

A volume may have a different letter in different Windows operating systems. For example, volume E: might appear as D: or L: when you boot another Windows operating system installed on the same machine. It is also possible that this volume will have the same letter E: under any Windows operating system installed on the machine. Moreover, a dynamic disk created in one Windows operating system is considered as a **Foreign Disk** in another Windows operating system or might even be unsupported by this operating system.

When you need to perform a disk management operation on such machine, it is necessary to specify for which operating system the disk management operation will be performed, i.e. specify the disk layout.

The name of the currently selected operating system is shown on the toolbar after "**Disk layout:**". Click the operating system name to select another operating system in the **Operating System Selection** window.

Under bootable media, this window appears immediately after Acronis Disk Director is launched. The disk layout will be displayed according to the operating system you select.

4.7 Performing operations

In Acronis Disk Director, all operations on disks and volumes are performed in the same way.

To perform any operation

1. Do any of the following:
   - Click the disk or the volume, and then select the required action in the **Actions** menu.
   - Click the disk or the volume, and then select the required action on the **Actions** pane.
   - Right-click the disk or volume, and select the required action in the context menu.

   Note: *the list of available actions in the* ***Actions*** *menu, the context menu and the* ***Actions*** *pane depends on the selected volume or disk type. The same also applies to unallocated space.*
2. You will be forwarded to the operation specific window, or the wizard page, where you have to specify the operation's settings.
3. Click **OK**. The operation will not be performed immediately, but will be considered pending (p. 20) and added to the pending operation list.

You can prepare a sequence of operations to be performed on disks and volumes. All pending operations will be performed only after you commit them.

Nevertheless, the results of any pending disk or volume operation are immediately displayed in the product main window. For example, if you create a volume, it will be immediately shown in the table

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view at the top, as well as in the graphical view at the bottom. Any volume changes, including changing the volume letter or label, are also immediately displayed.

While an operation is pending it can be easily undone and redone—see Undoing pending operations (p. 21).

4.7.1 Pending operations

Almost all the operations are considered pending before you commit them. Until then, Acronis Disk Director will only demonstrate the new volume structure that will result from the operations, planned to be performed on disks and volumes.

This approach enables you to control all planned operations, double-check the intended changes, and, if necessary, undo operations before they are executed.

All pending operations are added to the pending operations list that can be viewed in the **Pending operations** window.

To view and commit pending operations

1. On the toolbar, click **Commit pending operations**.
2. In the **Pending operations** window, view and examine the list of pending operations.
3. Click **Proceed** to execute the operations. You will not be able to undo any operations after you choose to proceed the operation.

To quit the **Pending operations** window without committing, click **Cancel**.

If you try to exit Acronis Disk Director while there are pending operations that are not yet committed, you will be asked whether you want to commit them. Quitting the program without committing the pending operations effectively cancels them.

4.7.2 Undoing pending operations

Any pending operation can be undone or redone.

To undo the latest pending operation in the list

do any of the following:

- Click the **Undo** button on the toolbar
- Press **Ctrl** + **Z**

Undoing an operation results in canceling one or more pending operations. While the list is populated, this action is available.

To redo the last pending operation that was undone

do any of the following:

- Click the **Redo** button on toolbar
- Press **Ctrl** + **Y**

4.8 Log

The Log stores the history of operations performed on the machine using Acronis Disk Director. For instance, when you create a new volume, the respective entry is added to the log. With the log, you

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can examine information about disk and volume operations, including reasons any for failures. Physically, a log is a collection of XML files stored on the machine.

Operations performed using bootable media are logged as well, but the log's lifetime is limited to a current session. Rebooting eliminates the log, but you can save the log to a file while the machine is booted with the media.

To browse the Log

Select **View** -> **View log** from the menu.

Way of working with the log

- Use filters to display the desired log entries. You can also hide the unneeded columns and show the hidden ones. See the Filtering and sorting log entries (p. 22) section for details.
- In the log table, select the log entry (or log entries) to take action on it—see Actions on log entries (p. 21).
- Use the **Information** panel to review detailed information on the selected log entry. The panel is collapsed by default. To expand the panel, click the chevron. The content of the panel is also duplicated in the **Log entry details** window.

4.8.1 Actions on log entries

The following is a guideline for you to perform actions on log entries.

All the operations described below are performed by clicking the corresponding items on the log **toolbar**.

To	Do
Select a single log entry	Click on it.
Select multiple log entries	▪ *non-contiguous*: hold down **CTRL** and click the log entries individually ▪ *contiguous*: select a single log entry, then hold down **SHIFT** and click another entry. All the entries between the first and last selections will be selected too.
View a log entry's details	1. Select a log entry. 2. Do one of the following ▪ Click **View Details**. The log entry's details will be displayed in a separate window. ▪ Expand the **Information** panel, by clicking the chevron.
Save the selected log entries to a file	1. Select a single log entry or multiple log entries. 2. Click **Save Selected to File**. 3. In the opened window, specify a path and a name for the file.
Save all the log entries to a file	1. Make sure, that the filters (p. 22) are not set. 2. Click **Save All to File**. 3. In the opened window, specify a path and a name for the file.

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Save all the filtered log entries to a file	1. Set filters (p. 22) to get a list of the log entries that satisfy the filtering criteria. 2. Click **Save All to File**. 3. In the opened window, specify a path and a name for the file. As a result, the log entries of that list will be saved.
Delete all the log entries	Click **Clear Log**. All the log entries will be deleted from the log, and a new log entry will be created. It will contain information about who deleted the entries and when.

4.8.2 Filtering and sorting log entries

The following is a guideline for you to filter and sort log entries.

To	Do
Display log entries for a given time period	1. In the **From** field, select the date starting from which to display the log entries. 2. In the **To** field, select the date up to which to display the log entries.
Filter log entries by owner and code	Type the required value (owner name, code number) in the field below the respective column header. As a result you will see that the list of log entries fully or just partly coincide with the entered value.
Filter log entries by type	Press or release the following toolbar buttons: to filter error messages to filter warning messages to filter information messages
Sort log entries by date and time; type; message	Click the column's header to sort the log entries in ascending order. Click it once again to sort the log entries in descending order.

Configuring the log table

By default, the table has three columns that are displayed, the others are hidden. If required, you can hide the shown columns and show the hidden ones.

To show or hide columns

1. Right-click any column header to open the context menu. The menu items that are ticked off correspond to the column headers presented in the table.
2. Click the items you want to be displayed/hidden.

4.9 Collecting system information

The system information collection tool gathers system information about the machine and saves it to a file. You may want to provide this file when contacting Acronis technical support.

To collect system information

1. Select **Help** -> **About** -> **Collect system information** from the top menu.
2. Specify where to save the file with system information.

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4.10 How to

How to create a volume that spans across several disks?

Create a dynamic volume (spanned or striped) by using the Create volume (p. 25) wizard.

How to increase a volume size at the expense of other volumes' unallocated space?

Resize (p. 27) the volume.

How to merge two volumes without losing your data?

Use the Merge (p. 30) operation.

How to make the existing volume fault-tolerant?

Add a mirror (p. 35) to this volume.

How to recover an accidentally deleted basic volume that has important data?

Use the Recovery Expert (p. 56) tool.

How to replace a hard disk without reinstalling the operating system and applications?

Use the Clone (p. 41) operation.

How to move dynamic disks from one system to another?

Use the Import foreign disks (p. 47) operation.

How to get quick access to the data stored on a Linux volume under Windows?

Use the Browse files (p. 37) operation.

How to place files from a Linux volume into a folder on a Windows volume?

Use the Merge (p. 30) operation, selecting the Windows volume as the main volume.

How to erase all information on the volume?

Use the Format (p. 30) operation.

How to increase the system performance?

Use the Defragmentation (p. 37) operation.

How to verify the logical integrity of a file system on a volume and repair any errors found?

Use the Check (p. 37) operation.

How to explore data stored on a volume before performing any operation?

Use the Browse files (p. 37) operation.

How to work with hard disk drives that use 4-KB sector size?

Follow the guidelines described in the Volume alignment in disks having a 4-KB sector size (p. 14) section.

How to save, copy and restore the MBR?

Read the Usage examples (p. 76) section of Acronis Disk Editor.

How to change the volume's cluster size?

Use the Change cluster size (p. 38) operation.

How clean up the disk?

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Use the Clean up disk (p. 48) operation.

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5 Volume operations

This section describes all the operations that you can perform with volumes in Acronis Disk Director.

Acronis Disk Director must obtain exclusive access to the target disk/volume. This means no other disk management utilities (such as the Windows Disk Management utility) can access it at that time. If you receive a message stating that the disk/volume cannot be blocked, close the disk management applications that use this disk/volume and start again. If you cannot determine which applications use the disk/volume, close them all.

In this section

Creating a volume 25
Resizing a volume....27
Copying a volume....28
Moving a volume....28
Merging basic volumes 30
Formatting a volume....30
Deleting a volume 31
Splitting a basic volume 31
Changing a volume label....32
Changing a drive letter....33
Converting a primary volume to logical....33
Converting a logical volume to primary....34
Changing a partition type....34
Setting a volume active....35
Adding a mirror 35
Removing a mirror 36
Breaking a mirrored volume 36
Browsing a volume's content....37
Checking a volume for errors....37
Defragmenting a volume 37
Changing a cluster size....38
Changing a file system 38
Hiding a volume 39
Unhiding a volume 39
Specifying i-node density 40

5.1 Creating a volume

You might need a new volume to:

- Store data—for example, a music collection, photo albums, or video files;
- Store backups (images) of other volumes/disks (especially boot volumes) to be able to recover the system in case of disaster;
- Install a new operating system (or swap file).

To create a new volume

1. Run the **Create Volume Wizard** by right-clicking any unallocated space, and then click **Create volume**.

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2. Specify the type that the new volume will have. Every volume type is provided with a brief description to let you better understand the advantages and limitations of each possible volume type. To learn more about volume types—see Types of basic volumes (p. 11) and Types of dynamic volumes (p. 12).

   The list of volume types contains only the types that are supported (p. 13) by the current operating system.

3. Depending on the type of the new volume, specify one or more disks where you want to create the new volume:
   - If the new volume is basic, select one basic disk and specify one region of unallocated space on that disk.

     Note: *You cannot create a basic volume on a disk that already has four primary volumes; you first need to convert one of those volumes to logical—see Converting a primary volume to logical (p. 33). This restriction does not apply to GPT disks.*

   - If the new volume is simple or spanned, select one or more disks.
   - If the new volume is striped, select two or more disks.
   - If the new volume is mirrored, select two disks.

   Note for striped and mirrored volumes: *Because these volumes occupy space on their disks in equal parts, the maximum size of such volume will depend on the selected disk with the least amount of unallocated space.*

   When creating a dynamic volume and selecting one or several basic disks as its destination, the selected disks will be converted to dynamic automatically.
4. Specify the size of the new volume. By default, the volume size is set to maximum. To specify a different size, move the slider or enter the required value into the **Volume size** field.

   If the disk still has unallocated space after you have set the size of the volume, you can set the amount of unallocated space before and after the basic volume. To do this, drag the volume within the unallocated space, or type the required amount of space before and after the volume in the respective fields.

   In the volume layout diagram at the bottom of the window, you can specify the space that the volume will occupy on each of the selected disks, by typing the amounts or by dragging the sliders.
5. Specify the following options of the new volume:
   - **File system** (by default, **NTFS**). Some of the supported file systems (p. 7) will be disabled depending on the chosen volume type and size—for example, FAT32 will be disabled if the volume size has been set at more than 2 TB.
   - **Cluster size**. Select the cluster size—the smallest amount of disk space which will be allocated to store a file. We recommend leaving the default size, which is marked in the list as **(default)**. The default cluster size depends on the volume size and the type of the file system—for example, the default cluster size for up to 2-TB NTFS volumes is 4 KB.
   - **Volume label** (by default, NONE). A short name that you can assign to a volume to better differentiate it from other volumes. The maximum length of a volume label depends on the volume's file system—see Changing a volume label (p. 32).
   - **Letter** (by default, the first free letter of the alphabet). Assign a drive letter to the volume to be able to locate files and folders on it.

   If the new volume is basic, specify whether it will be:
   - **Primary**. Set the volume as **Primary**, if you plan to install an operating system on it. Mark the primary volume as **Active**, if you need the machine to start from this volume.

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- **Logical**. Set the volume as **Logical**, if it is intended for data storage.

6. Click **Finish** to add the pending volume creation operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.2 Resizing a volume

This operation extends a volume—whether basic or dynamic—by taking unallocated space from one or more disks; or reduces a volume so that a portion of the volume's free space becomes unallocated space.

Extending a basic volume. A basic volume occupies a single region on a single basic disk. When you extend a basic volume, you can choose to **leave the disk as basic** and use only the unallocated space that is **adjacent to the volume.** Alternatively, you can choose to **convert the disk to dynamic** and use unallocated space from **all dynamic disks** on your machine. In the second case, the volume will become a simple or spanned volume.

Resizing a volume from which the machine or an operating system starts. You can resize the system volume, a boot volume, or the active volume only when it is a basic volume.

To resize a volume

1. Select the volume that you want to resize, and then click **Resize volume**.
2. Specify the new size of the volume, by typing it or by moving the slider.
3. When resizing a basic volume:
   - To be able to use only unallocated space that is adjacent to the volume, click **Leave the volume as basic**. The volume will remain a basic volume.
   - To be able to use unallocated space from all dynamic disks on the machine, click **Convert the volume to simple/spanned**. The volume will be converted to a simple or spanned volume, and the corresponding disk will become dynamic.

     Note: *This option is not available if the volume is the system volume, a boot volume, or the active volume.*

   If you choose the **Leave the volume as basic** option, the following options are available:

   - **Append all unallocated disk space to the volume**

     With this option, all unallocated space on the disk will become adjacent to the volume that you are resizing. This may involve relocating other volumes within the disk.

     As a result you will be able to extend the volume by using all unallocated space, including the unallocated space that is not currently adjacent to the volume, while keeping the disk as a basic disk.

     When this check box is selected, the following option is available:

     - **Take free space from other volumes**

       With this option, other volumes on the disk will be reduced so that only a specified percentage of the corresponding current free space will remain on each of those volumes.

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As a result you will get additional unallocated space, which will be adjacent to the volume that you are resizing.

By default, this option does not apply to the boot volumes on the disk. To include these volumes, select the **Use free space on boot volumes** check box.

4. Examine how the resized volume will be located on the disk or disks, by using the preview area at the bottom of the window.
5. Click **OK** to add the pending volume resizing operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.3 Copying a volume

This operation copies a volume by creating a new volume and copying the original volume's content to it.

Unlike copying all files from the volume, copying the volume itself ensures that the entire content of the new volume is the same.

The original and new volumes can have different types and sizes. For example, you can copy a striped volume as a larger simple volume.

Important: *When you copy the system volume, the active volume, or a boot volume, you might not be able to boot the machine from the new volume. Bootability will be preserved when you move such volume (p. 28) or clone the disk (p. 41) containing it.*

To copy a volume

1. Select the volume that you want to copy, and then click **Copy volume**.
2. Select the type that the new volume will have. The default type is that of the original volume.
3. Depending on the type of the new volume, specify one or more disks where you want to create the new volume:
   - If the new volume is basic, select one basic disk and specify one region of unallocated space on that disk.
   - If the new volume is simple or spanned, select one or more disks.
   - If the new volume is striped, select two or more disks.
   - If the new volume is mirrored, select two disks.

   Note for striped and mirrored volumes: *Because these volumes occupy space on their disks in equal parts, the maximum size of such volume will depend on the selected disk with the least amount of unallocated space.*
4. Specify the size of the new volume. This size cannot be less than the size of data on the original volume. For a basic volume, you can increase its size only by taking unallocated space that is adjacent to it.

   In the volume layout diagram at the bottom of the window, you can specify the space that the volume will occupy on each of the selected disks, by typing the sizes or by dragging the sliders.
5. Click **Finish** to add the pending volume copying operation.

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The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.4 Moving a volume

This operation moves a volume by creating a new volume, copying the original volume's content to it, and then deleting the original volume.

Unlike moving all files from the volume, moving the volume itself ensures that the entire content of the new volume is the same. This is important if you are moving a volume from which Windows starts.

The original and new volumes can have different types. For example, you can move a striped volume as a larger simple volume.

Tip: *If you want to relocate a basic volume within the same disk, you can use the resizing a volume (p. 27) operation instead of this operation. Namely, you can leave the size of the volume unchanged, but change the amount of unallocated space before and after the volume.*

For details about moving a volume from which the machine or a Windows operating system starts, see "Moving system, boot, and active volumes" later in this section.

Caution: *Avoid moving a volume from which an operating system other than Windows, such as Linux, starts. Otherwise, that operating system may become unbootable.*

To move a volume

1. Select the volume that you want to move, and then click **Move volume**.
2. Select the type that the new volume will have. The default type is that of the original volume.
3. Depending on the type of the new volume, specify one or more disks where you want to create the new volume:
   - If the new volume is basic, select one basic disk and specify one region of unallocated space on that disk.
   - If the new volume is simple or spanned, select one or more disks.
   - If the new volume is striped, select two or more disks.
   - If the new volume is mirrored, select two disks.

   Note for striped and mirrored volumes: *Because these volumes occupy space on their disks in equal parts, the maximum size of such volume will depend on the selected disk with the least amount of unallocated space.*
4. Specify the size of the new volume. This size cannot be less than the size of data on the original volume. For a basic volume, you can increase its size only by taking unallocated space that is adjacent to it.
5. In the volume layout diagram at the bottom of the window, you can specify the space that the volume will occupy on each of the selected disks, by typing the sizes or by dragging the sliders.
6. Click **Finish** to add the pending volume moving operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

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To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

Moving system, boot, and active volumes

Important: *Do not move any of these volumes unless you absolutely need to. If you want to transfer your system to a new hard disk, consider disk cloning instead—see Basic disk cloning (p. 41).*

The machine or its operating system will not always remain bootable after you move such volume. To preserve bootability, follow these guidelines:

- If the volume is system or active (that is, the volume from which the machine starts), you should move it only if it is located on a basic disk; move it only within that basic disk.
- If the volume is a boot volume (that is, the volume from which one of the installed Windows operating systems starts), you should move it only when it is located on a basic disk; move it to the same or a different basic disk.

A reboot is required when you move the boot volume of the currently running Windows operating system, the system volume, or the active volume.

5.5 Merging basic volumes

This operation lets you merge two adjacent basic volumes, even if their file systems are different. All data will remain intact and reside on the resultant volume. The resultant volume will have the same label, letter and file system as the **main** volume—that is, the volume to which data from the other volume will be added.

Free space requirements. The combined amount of free space on the main volume and on the other volume must be at least 5 percent of the size of data on the other volume. For example, if files and folders on the other volume occupy 100 GB, you need a combined total of 5 GB of free space, for example 2 GB on one volume and 3 GB on another.

Caution: *Volumes that contain encrypted files cannot be merged.*

To merge basic volumes

1. Right-click the volume that you need to be merged, and then click **Merge volume**.
2. Select another volume you need to merge.

   In **Main volumes**, specify which one of the selected volumes will be considered as a **main**. Data from the other volume will be added to a separate folder on the main volume. This folder will be named according to the volume label and volume letter (if present); for example: **Merged Volume 'System' (C)**
3. Click **OK** to add the pending volumes merging operation.

   At the bottom of the window, you can estimate how the resultant volume will look like after the merging.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

Merging an NTFS volume to a volume with a file system that does not support security options (for example, FAT32 volume), will result in the loss of security settings (volume ownership data and access permissions). With

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the opposite action (merging a non-secured volume to a secured one), the main volume security settings will be assigned to the resultant volume.

5.6 Formatting a volume

The formatting operation prepares a volume to store files and folders, by creating a file system on it.

***Caution:** Formatting destroys all data that is currently stored on the volume.*

You may want to format a volume in the following cases:

- When you are creating the volume. In this case, the formatting window is part of the **Create Volume Wizard**.
- When you want to quickly destroy data on the volume—for example, as a security best practice.
- When you want to change the volume's file system to later store files more efficiently.

To format a volume

1. Right-click the volume that you want to format, and then click **Format**.
2. In **File system**, select the file system that you want to create on the volume. The NTFS file system is recommended for most Windows operating systems.

   ***Note:** The FAT16 and FAT32 file systems can be created on a volume of up to 2 GB and up to 2 TB in size, respectively.*

   For the list of supported file systems, see Supported file systems (p. 7).
3. In **Cluster size**, specify the cluster size—also known as allocation unit size—for the file system.

   We recommend leaving the default size, which is marked in the list as **(default)**.

   For more information on choosing the cluster size, see "More about cluster sizes" later in this section.
4. Optionally, in **Volume label**, type the volume label that you want to assign to the volume to better differentiate it from other volumes.

   The maximum number of characters in the volume label depends on the file system that you selected—see Changing a volume label (p. 32).
5. Click **OK** to add the pending volume formatting operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

More about cluster sizes

Using the default cluster size is normally the best option.

Smaller cluster sizes allow for more efficient storage if the volume is to contain a vast number of very small files.

Bigger cluster sizes make it possible for the volume to have a size beyond normal limits. For example, you can create a 4-GB volume with the FAT16 file system, by using a cluster size of 64 KB.

***Important:** Some programs do not work correctly with volumes whose file systems have big cluster sizes, such as a cluster size of 64 KB in the FAT16 and FAT32 file systems, and cluster sizes of 8 KB through 64 KB in the*

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NTFS file system. For example, these programs may incorrectly calculate the total and available space on such volumes.

5.7 Deleting a volume

This operation deletes a selected volume. The space that was occupied by the volume becomes unallocated space on the corresponding disk or disks.

Caution: *After you delete the volume, all data that is stored on it will be lost.*

Tip: *Deleting a mirrored volume means deleting both of its mirrors. For information on how to delete only one mirror, see Removing a mirror (p. 36).*

To delete a volume

1. Right-click the volume that you want to delete, and then click **Delete volume**.
2. Click **OK** to add the pending volume deletion operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.8 Splitting a basic volume

This operation splits a basic volume in two by using a portion of the volume's free space to create another basic volume.

When splitting a basic volume, you can move some files and folders from it to the new volume.

The original basic volume will retain its type (primary or logical), volume letter, and volume label.

The new basic volume:

- Will be a logical volume.
- Will be assigned the first available volume letter.
- Will have the same volume label as the original volume.

Free space requirements. The original volume needs to have at least 16 MB of free space. The required space will be available again as soon as splitting is finished.

Caution: *Volumes that contain encrypted files cannot be split.*

To split a basic volume

1. Right-click the basic volume that you need to split, and then click **Split volume**.
2. To move some files and folders from the original volume to the new volume, select the **Move selected files to created volume** check box, then click **Select**, and then select the files and folders that you want to move.

   Caution: *When splitting a boot volume, avoid moving system folders, such as Windows or Program Files. Otherwise, the corresponding Windows operating system will likely fail to start.*
3. Specify the size of the new volume, by typing it or by dragging the slider.
4. Click **OK** to add the pending volume splitting operation.

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The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.9 Changing a volume label

The volume label is a short name that you can assign to a volume to better differentiate it from other volumes.

In Acronis Disk Director, the volume label is shown in the list of volumes and is followed by the drive letter (if present)—for example: **System (C:)**

Unlike the volume's drive letter—which may be different in different Windows operating systems installed on the machine—the volume label remains the same even after the hard disk drive with the volume has been moved to another machine.

The maximum length of a volume label depends on the volume's file system. For example, it is 32 characters for the NTFS file system, 11 characters for the FAT16 and FAT32 file systems, and 16 characters for the ext2 and ext3 file systems.

To change a volume label

1. Right-click the volume whose label you want to change, and then click **Change label**.
2. In **New label**, type the new volume label.

   Note: *Some file systems—for example, FAT16 and FAT32 (see below)—do not allow certain characters in the volume label. The* ***OK*** *button will remain disabled as long as the label you typed contains such characters.*
3. Click **OK** to add the pending volume label changing operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

Label characters not allowed in FAT16 and FAT32

The FAT16 and FAT32 file systems do not allow the following characters in the volume label: backslash (\), slash (/), colon (:), asterisk (*), question mark (?), quotation mark ("), less than sign (<), greater than sign (>), and pipe (|).

Volumes whose labels cannot be changed

You cannot assign a volume label to a volume whose file system is shown as **Unsupported**, **Not formatted**, or **Linux swap**.

If an Acronis backup product, such as Acronis True Image Home, is installed on your machine, you may have a volume known as Acronis Secure Zone (ASZ). The volume label of this volume cannot be changed.

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5.10 Changing a drive letter

Windows operating systems assign drive letters, such as C, to volumes to locate files and folders on them.

You can set up, modify, or remove the drive letter of a volume that is supported by Windows; namely, a volume whose file system is FAT16, FAT32, or NTFS.

The change will affect only the Windows operating system whose disk layout is currently selected—by default, the currently running Windows operating system. For information on how to select the disk layout, see Disk layout (p. 19).

Caution: *Avoid changing the drive letter of a boot volume. Otherwise, the corresponding Windows operating system or some of the installed programs might fail to work normally.*

To change a drive letter

1. Right-click the volume whose drive letter you want to change, and then click **Change letter**.
2. Select a new drive letter from the list of available ones. To leave the volume without a drive letter, click **Do not assign a letter**.
3. Click **OK** to add the pending drive letter changing operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.11 Converting a primary volume to logical

This operation applies to basic disks whose partitioning scheme is MBR. It converts a primary volume on such disk to a logical volume.

Each basic MBR disk can have either up to four primary volumes, or up to three primary volumes plus an unlimited number of logical volumes.

You need to convert a primary volume to logical if you want to later create a fifth volume on a disk that currently has four primary volumes.

The size of the converted volume might differ slightly from that of the original primary volume, because some space might be required to store supplementary information.

Caution: *Avoid converting the active volume or the system volume to logical. Otherwise, the machine will likely become unbootable.*

You can later convert the volume back to primary—see Convert to primary (p. 34).

To convert a primary volume to logical

1. Right-click the primary volume that you want to convert to logical, and then click **Convert to logical**.
2. Click **OK** to add the pending primary volume to logical conversion operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

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To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.12 Converting a logical volume to primary

This operation applies to basic disks whose partitioning style is MBR. It converts a logical volume on such disk to a primary volume.

Each basic MBR disk can have either up to four primary volumes, or up to three primary volumes plus an unlimited number of logical volumes.

You need to convert a logical volume to primary if you want to restore the bootability of a machine whose system volume was accidentally converted to logical.

If the disk contains more than one logical volume, you can convert a logical volume to primary only when there are two or less primary volumes on the disk.

You can later convert the volume back to logical—see Convert to logical (p. 33).

To convert a logical volume to primary

1. Right-click the logical volume that you want to convert to primary, and then click **Convert to primary**.
2. Click **OK** to add the pending logical volume to primary conversion operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.13 Changing a partition type

This operation changes the partition type of a volume—a hexadecimal number that normally identifies the file system or the intended use of the volume.

For example, NTFS volumes have a partition type of 07h.

By changing the partition type, you can “hide” the volume from the operating system.

To change a partition type

1. Right-click the volume whose partition type you need to change, and then click Change partition type.
2. Select the desired partition type from the list—for example, **017h Hidden NTFS, HPFS**.
3. Click **OK** to add the pending partition type changing operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

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5.14 Setting a volume active

This operation applies to primary volumes on basic MBR disks.

To specify the volume from which the machine will start, you need to set a volume to become active. A disk can have only one active volume, so if you set a volume as active, the volume, which was previously active, will be automatically unset.

To set a volume active

1. Right-click the primary volume you want to set as active, and then click **Mark as active**.

   If there is no other active volume in the system, the pending volume setting active operation volume will be added.

   Note: *By setting the new volume active, the former active volume letter might be changed and some of the installed programs might stop running.*

2. If another active volume is present in the system, you will receive a warning that the previous active volume will no longer be active. Click **OK** in the **Warning** window to add the pending volume setting active operation.

   Even if you have the operating system on the new active volume, in some cases the machine will not be able to boot from it. You will have to confirm your decision to set the new volume active.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.15 Adding a mirror

Mirrored volumes provide fault tolerance by storing two exact copies of data—called mirrors—on two different disks.

Adding a mirror to a basic or simple volume means converting that volume to a mirrored volume, which involves copying the volume's data to another disk.

To add a mirror to a volume

1. Right-click the basic or simple volume to which you want to add a mirror, and then click **Add mirror**.
2. Select the disk on which you want to place the mirror. The disks that do not have enough unallocated space to create the mirror are not available for selection.

   If you are adding a mirror to a basic volume or are placing the mirror on a basic disk, you will receive a warning that the corresponding disk (or disks) will be converted to dynamic.
3. Click **OK** to add the pending addition of a mirror to the volume operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

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5.16 Removing a mirror

Mirrored volumes provide fault tolerance by storing two exact copies of data—called mirrors—on two different disks.

Removing a mirror from a mirrored volume means converting that volume to a simple volume, thus losing fault tolerance.

The space that was occupied by the removed mirror becomes unallocated space on the corresponding disk (provided that that disk is not missing).

You may want to remove a mirror in the following cases:

- When you need extra unallocated space on a disk containing one of the mirrors, at the expense of losing fault tolerance
- When a disk containing one of the mirrors becomes missing—for example, after you replaced a failed hard disk drive with a new one

You can later make the volume fault-tolerant again by adding a mirror to it—see Add mirror (p. 35).

You cannot remove a mirror when both disks containing the mirrored volume are missing.

To remove a mirror from a mirrored volume

1. Right-click the mirrored volume from which you want to remove a mirror, and then click **Remove mirror**.
2. Select the mirror that you want to remove.

   Note: *If one of the mirrors is located on a missing disk, you can remove only that mirror.*
3. Click **OK** to add the pending mirror removal operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.17 Breaking a mirrored volume

Mirrored volumes provide fault tolerance by storing two exact copies of data—called mirrors—on two different disks.

Breaking a mirrored volume means converting its two mirrors into two independent simple volumes with initially identical content.

One of the two volumes will retain the drive letter and volume label of the mirrored volume. You can assign a drive letter and/or volume label to the other volume.

This operation differs from removing a mirror—see Remove mirror (p. 36)—in that when you remove a mirror, only the remaining mirror becomes a simple volume.

You can break a mirrored volume only when the disks containing both of its mirrors are online.

To break a mirrored volume

1. Right-click the mirrored volume that you want to break, and then click **Break mirror**.

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2. For one of the two mirrors, specify the volume label and/or drive letter that the mirror will have when it is converted to a volume. To not assign a drive letter to the volume, click **Do not assign the letter**.

   The other mirror will be assigned the drive letter and volume label of the original mirrored volume.
3. Click **OK** to add the pending mirrored volume breaking operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.18 Browsing a volume's content

Before configuring any operations on a volume—we recommend you to view its contents to make sure you choose the right volume. It can be especially useful in cases when a volume cannot be seen by Windows Explorer—for example, a volume with Linux file systems, or when running Acronis Disk Director from bootable media where there are no tools to view what is exactly stored on a volume.

To browse a volume's content

1. Right-click the volume whose contents you need to browse, and then click **Browse files**.
2. In the **Browse** window, expand the folder tree to explore files and folders on the selected volume.
3. When you are finished with browsing, click **OK**.

Note: *The **Browse** window shows the real volume contents, read from the disk. If there are some operations pending, such as splitting a volume, you will not be able to explore the locked volumes until the operations are committed or canceled. However, operations on folders in the **Browse** window are executed immediately.*

5.19 Checking a volume for errors

This operation is enabled in Windows operating systems, and is disabled under bootable media.

This operation enables you to verify the logical integrity of a file system on a volume (for FAT16/32 and NTFS file systems) and repair any errors found.

Hard disk volumes should be checked before configuring any operation on them—see Precautions (p. 16).

Acronis Disk Director does not perform the checking itself, rather it launches the Check Disk tool (Chkdsk.exe) included in Windows operating system.

To check a volume

1. Right-click the volume whose file system you need to check, and then click **Check**.
2. To find and fix errors (if any), select the **Fix found errors** check box.
3. To locate bad sectors and recover readable information, select the **Try to fix found bad sectors** check box.
4. Click **OK** to run the volume check. If the volume contains a very large number of files—for example, millions—the check can take a long time to complete. The results of the operation will be displayed in a separate window.

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Note: *If the volume is in use, the tool can only check it for errors, but cannot repair them. The checking and fixing of errors on this volume will be performed the next time you restart the system.*

5.20 Defragmenting a volume

This operation is enabled in Windows operating systems, and is disabled under bootable media.

Defragmentation increases the system performance by consolidating fragmented files on a volume. Fragmentation occurs when the operating system cannot allocate enough contiguous space to store a complete file as a unit and thus, writes different pieces of a file in gaps between other files. The defragmentation rearranges pieces of each file as close together and contiguously as possible, minimizing the time required to access it.

Acronis Disk Director does not perform defragmentation itself, rather it launches the Disk Defragmenter tool (Defrag.exe) included in Windows operating system.

To defragment a volume

1. Right click the volume you need to defragment, and then click **Defragment**.
2. In the **Defragmentation** window, click **OK** to start defragmenting the volume.

   Depending on the amount of fragmented files, the defragmentation may take a long time to complete. The results will be displayed in a separate window.

5.21 Changing a cluster size

Changing a cluster size of a volume affects the amount of free/used disk space.

Smaller cluster sizes allow for more efficient storage of smaller files by reducing the amount of wasted disk space. Furthermore, larger files may become more fragmented across the volume, increasing the amount of time that is needed to access them.

Bigger cluster sizes improve performance by decreasing the time to access to larger files. However, having a bigger cluster size wastes disk space if the typical size of the files stored on the volume is smaller than the cluster size.

To change cluster size

1. Right-click the volume whose cluster size you need to change, and then click **Change cluster size**.
2. Select the required cluster size from the list. The default cluster size is marked in the list as **(default)**. The default cluster size depends on the volume size and the type of the file system. For example, the default cluster size for up to 2-TB NTFS volumes is 4 KB.

   Important: *The program does not allow you to select a particular cluster size if, the free volume space will decrease to the point where the data will not fit on the volume.*

   Some programs do not work correctly with volumes whose file systems have big cluster sizes, such as a cluster size of 64 KB in the FAT16 and FAT32 file systems, and cluster sizes of 8 KB through 64 KB in the NTFS file system. For example, these programs may incorrectly calculate the total and available space on such volumes. Acronis Disk Director displays warning messages, when you select such cluster sizes.
3. Click **OK** to add the pending cluster size changing operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

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5.22 Changing a file system

This operation lets you change the volume file systems of the following type:

- FAT16 to FAT32 and back
- Ext2 to Ext3 and back

The table below describes main differences between the file systems.

Feature	FAT16	FAT32	Ext2	Ext3
Maximum volume size	2 GB (4-KB Cluster Size) or 4 GB (64-KB Cluster Size)	2 TB (4-KB Cluster Size) or 8 TB (64-KB Cluster Size)	2 TB (4-KB Block Size) or 32 TB (8-KB Block Size)	2 TB (1-KB Block Size) or 32 TB (8-KB Block Size)
Maximum file size	2 GB	4 GB	2 TB	2 TB
Maximum file name length	255	255	255	254
Partitioning scheme	MBR	MBR	MBR, GPT, APM	MBR, GPT

To change a file system

1. Right-click the volume whose file system you need to convert, and then click **Change file system**.
2. Select the required file system.
3. Click **OK** to add the pending file system changing operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.23 Hiding a volume

This operation applies to volumes on basic MBR disks.

Hiding a volume means changing the volume type so that the operating system cannot "see" this volume. You may want to hide a volume in order to protect information from unauthorized or casual access. Hiding a volume does not affect letters assigned to other volumes, but the hidden volume loses its letter and this letter becomes free for assignment.

Important: *Hiding a volume that contains a swap file will prevent your machine from booting. Hiding a system volume or a boot volume with a currently running operating system is disabled in order to retain your machine bootability.*

To hide a volume

1. Right-click the volume you need to hide, and then click **Hide volume**.

   If the volume has mount points, they will be removed automatically.
2. Click **OK** to add the pending volume hiding operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

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To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.24 Unhiding a volume

This operation applies to hidden volumes on basic MBR disks.

Unhiding a hidden a volume means changing the volume type so that it will be visible by the operating system. You may want to unhide a volume in order to:

- Make a previously hidden volume again visible to the operating system.
- Access data and make changes to files stored on a hidden OEM volume.

To unhide a volume

1. Right-click the hidden volume you need to unhide, and then click **Unhide volume**. The program automatically assigns the first vacant drive letter to this volume.
2. Click **OK** to add the pending volume unhiding operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

5.25 Specifying i-node density

This operation applies to volumes whose file systems are Ext2 or Ext3.

The i-node is the main data structure for Linux Ext2/Ext3. All of a files information, with the exception of its actual name and data, is stored in the i-node. Each file has its own i-node. Each i-node contains a file description, including number, file type, size, data block pointers, etc. Space for i-nodes is allocated when you install the operating system or when a new file system is created. The maximum number of i-nodes, and hence the maximum number of files, is set at file system creation.

Running out of i-nodes prohibits the creation of additional files and directories on the volume even if there is sufficient disk space. I-nodes themselves consume disk space, so specifying the i-node density lets you organize disk space in the optimal way. I-node density is determined by specifying the number of bytes per i-node. Usually, the default value is 4096 bytes per i-node.

Important: *If you change the i-node density of a boot volume the operating system will become unbootable. To restore the system bootability use a boot loader.*

To specify i-node density

1. Right-click the Ext2/Ext3 volume, and then click **Change i-node density**.
2. In **Bytes per i-node**, specify the required value.
   - Use lower i-node density (that is, increased **Bytes per i-node** value) for a volume that contains just a few large files. This will allocate more space for files and less for i-nodes. The less i-nodes there are the in the system, the faster the “file system check” operation will be performed.
   - Use higher i-node density (that is, reduced **Bytes per i-node** value) for volumes that contain a large number of small files. This will allocate more space for i-nodes and less for data. The

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more i-nodes there are in the file system, the less likely you will not run of i-nodes. But, the "file system check" operation will be performed slower.

3. Click **OK** to add the pending i-node density changing operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

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6 Disk operations

This section describes all the operations that you can perform with disks using Acronis Disk Director.

Acronis Disk Director must obtain exclusive access to the target disk/volume. This means no other disk management utilities (such as the Windows Disk Management utility) can access it at that time. If you receive a message stating that the disk/volume cannot be blocked, close the disk management applications that use this disk/volume and start again. If you cannot determine which applications use the disk/volume, close them all.

In this section

Disk initialization 41
Basic disk cloning 41
Disk conversion: MBR to GPT 43
Disk conversion: GPT to MBR 44
Disk conversion: basic to dynamic 44
Disk conversion: dynamic to basic 45
Changing a disk status: online to offline 46
Changing a disk status: offline to online 46
Importing foreign disks 47
Removing a missing disk 47
Cleaning up a disk 48

6.1 Disk initialization

If you add one or more new disks to your machine, you need to initialize them—that is, to register disks in the operating system. The newly detected disks appear in the disks and volumes list as **Not initialized**.

To initialize a disk or disks

1. Right-click the newly added disk (or any of newly added disks), and then click **Initialize**.
2. In the **Disk Initialization** window, select the other not initialized disks (if there are several), and set the disk partitioning scheme (MBR or GPT) and the disk type (basic or dynamic) for every selected disk.

   GPT partition scheme is not recognized by XP Home/XP Professional x86.
3. Click **OK** to add the pending disk initialization operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

After the initialization, all the disk space remains unallocated and so still impossible to be used for program installation or file storage. To be able to use it, you need to either create a new volume—see Creating a volume (p. 25), or to extend the existing volumes to the disk—see Resizing a volume (p. 27).

If you decide to change the disk settings it can be done later using Acronis Disk Director 11.

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6.2 Basic disk cloning

This operation is available for basic MBR disks.

The cloning operation transfers all the source disk data to a target disk. The source disk volumes can be cloned to the target disk "as is", or resized automatically with respect to the target disk size.

You may want to use cloning in the following cases:

- If you are about to replace an old hard disk with a new one without reinstalling operating systems and applications on the new disk.
- If you want to transfer all the volumes and their contents from the existing disk to a larger one.
- If you want to have an exact copy of one disk on another disk.

Important: *If you use an Acronis backup product, such as Acronis True Image Home, avoid cloning a disk that contains the Acronis Startup Recovery Manager (ASRM) component of that product. Otherwise, the machine might not be able to boot from the target disk.*

To clone a basic disk

1. Do any of the following:
   - Right-click the basic disk you want to clone (i.e. a **source** disk), and then click **Clone basic disk**.
   - Select **Clone basic disk** from the **Actions** pane. The program displays a list of partitioned disks and asks you to select the source disk, from which data will be transferred to another disk.
2. In the **Select a disk as target for the cloning operation** window, select a basic disk as **target** for the cloning operation. The program enables you to select a target disk if its size is sufficient to hold all the data from the source disk without any loss. If there is some data on the target disk, you will receive a warning stating that this data will be lost after the cloning.
3. In the **Select a cloning method** window, select the cloning method:
   - **As is** – information from the source disk is transferred to the target "As is". So, if the target disk is the same size and even larger, it is possible to transfer all the information there exactly as it is stored at the source. When cloning to a larger target disk, the remaining space becomes unallocated.
   - **Use proportional volume resizing** (for the supported file systems (p. 7)) – recommended when the target disk is larger, or smaller than the source. The program will automatically increase or decrease the (if possible) size of the volumes with respect to the target disk size. Thus, no unallocated space appears on the target disk.

     Note for smaller target disks*: the program analyzes the target disk to establish whether its size will be sufficient to hold all the data from the source disk without any loss. If such transfer with proportional resizing of the source disk volumes is possible, then you will be allowed to proceed. If due to the size limitations safe transfer of all the source disk data to the target disk is impossible even with the proportional resizing of the volumes, then the Clone basic disk operation will be impossible and you will not be able to continue.*
4. If you are about to clone a disk containing the system volume, pay attention to the **Advanced options**, described later in this section.
5. Click **Finish** to add the pending disk cloning operation

The results of the pending operation are immediately displayed as if the operation had been performed.

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To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

Using advanced options

When cloning a disk containing the system volume, you need to retain operating system bootability on the target disk volume, by copying the original disk's NT signature. The NT signature is a record that is kept in the disk's master boot record and uniquely identifies the disk. For the operating system to remain bootable, the target disk must have the same NT signature as the source disk.

Important: *Two disks with the same NT signature cannot work properly under one operating system. After cloning the disk and copying the NT signature, you should remove one of the disks from the machine.*

You have the following two alternatives to retain system bootability on the target disk volume:

- Copy NT signature – to provide the target disk with the source disk NT signature matched with the Registry keys also copied on the target disk.
- Leave NT signature – to keep the old target disk signature and update the operating system according to the signature.

If you need to copy the NT signature:

1. Select the **Copy NT signature** check box. You receive the warning stating that you will have to remove one of the two hard disk drives from the machine. The **Turn off the machine after the cloning operation** check box is selected and disabled automatically.
2. Click **Finish** to add the pending operation.
3. Click **Commit** on the toolbar and then click **Proceed** in the **Pending Operations** window.
4. Wait until the task is finished.
5. Wait until the machine is turned off.
6. Disconnect either the source or the target hard disk drive from the machine.
7. Start up the machine.

If you need to leave an NT signature:

1. Click to clear the **Copy NT signature** check box, if necessary.
2. Click **Finish** to add the pending operation.
3. Click **Commit** on the toolbar and then click **Proceed** in the **Pending Operations** window.
4. Wait until the task is finished.

6.3 Disk conversion: MBR to GPT

You may want to convert an MBR basic disk to a GPT basic disk in the following cases:

- If you need more than four primary volumes on one disk.
- If you need additional disk reliability against any possible data damage.
- If you need to make a volume whose size is over 2 TB.

Important: *If you have a primary volume, belonging to an MBR disk, and convert the disk first to GPT and then back to MBR, the volume will be logical and will not be able to be used as a boot volume. You can convert this volume to primary, as described in Converting a logical volume to primary (p. 34).*

Important: *The basic MBR disk that contains the boot volume with the currently running operating system cannot be converted to GPT.*

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To convert a basic MBR disk to basic GPT

1. Right-click the basic MBR disk you want to convert to GPT, and then click **Convert to GPT**.

   An information window will pop up, stating that you are about to convert MBR to GPT.
2. Click **OK** to add the pending MBR to GPT disk conversion operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

***Note**: A GPT-partitioned disk reserves the space at the end of the partitioned area necessary for the backup area, which stores copies of the GPT header and the partition table. If the disk is full and the volume size cannot be automatically decreased, the conversion of the MBR disk to GPT will fail.*

If you plan to install an operating system that does not support GPT disks, the reverse conversion of the disk to MBR is also possible through the same menu items. The name of the operation will be listed as **Convert to MBR**.

Dynamic disk conversion: MBR to GPT

The program does not support direct MBR to GPT conversion for dynamic disks. However, you can perform the following conversions to reach the goal using the program:

1. MBR disk conversion: dynamic to basic using the **Convert to basic** operation.
2. Basic disk conversion: MBR to GPT using the **Convert to GPT** operation.
3. GPT disk conversion: basic to dynamic using the **Convert to dynamic** operation.

6.4 Disk conversion: GPT to MBR

You may want to convert a basic GPT disk to a basic MBR disk in case you need to install an operating system and software that do not support GPT disks.

The program lets you convert a disk from GPT to MBR with the following implications:

- All volumes of the disk will be logical
- Boot volumes (if any) will be unbootable until you convert them to primary volumes—see Converting a logical volume to primary (p. 34)
- Volumes that allocate more than 2 TB from the beginning of the disk become inaccessible

To convert a GPT disk to MBR

1. Right-click the GPT disk you need to convert to MBR, and then click **Convert to MBR**.

   A warning window will pop up, stating that you are about to convert GPT into MBR.

   You will be explained the changes that will happen to the system after the chosen disk is converted from GPT to MBR. For example, if such conversion will stop the disk from being accessed by the system, the operating system will stop loading after such conversion or some volumes on the selected GPT disk will not be accessible with MBR (e.g. volumes that allocate more than 2 TB), you will be warned here about such implications.
2. Click **OK** to add the pending GPT to MBR disk conversion operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

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To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

6.5 Disk conversion: basic to dynamic

You would want to convert a basic disk to dynamic in the following cases:

- If you plan to use the disk as part of a dynamic disk group
- If you want to achieve additional disk reliability for data storage.

To convert a basic disk to dynamic

1. Right-click the basic disk you want to convert, and then click **Convert to dynamic**. You will receive a final warning about the basic disk being converted to dynamic.
2. Click **OK** to add the pending basic to dynamic disk conversion operation.

***Note**: A dynamic disk uses the last megabyte of the physical disk to store the database, including the four-level description (Volume-Component-Partition-Disk) for each dynamic volume. If during the conversion to dynamic it turns out that the basic disk is full and the size of its volumes cannot be decreased automatically, the basic disk to dynamic conversion operation will fail.*

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

Should you decide to revert your dynamic disks back to basic ones—for example, if you want to start using an operating system on your machine that does not support dynamic disks—you can convert your disks using the same menu items, though the operation now will be named **Convert to basic**.

System disk conversion

The program does not require an operating system reboot after conversion of a basic disk that contains one or more boot volumes to dynamic if:

1. There is a single Windows Vista, or Windows 7 operating system installed on the disk.
2. The machine runs this operating system.

***Caution:** The conversion of a disk containing boot volumes takes a certain amount of time. Any power loss, unintentional turning off of the machine or accidental pressing of the **Reset** button during the procedure could result in bootability loss.*

For machines where more than one operating system is installed, the program ensures **bootability** of each of the operating systems.

6.6 Disk conversion: dynamic to basic

You would want to convert dynamic disks back to basic ones if, for example, you want to start using an operating system your machine that does not support dynamic disks.

This operation is available only for a dynamic disk that is empty or contains only one or more simple volumes, with each simple volume occupying a single region on the disk. These volumes will become basic volumes.

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To convert a dynamic disk to basic

1. Right-click the dynamic disk you need to convert, and then click **Convert to basic**. You will receive a final warning about the dynamic disk being converted to basic.

   You will be advised about the changes that will happen to the system if the chosen disk is converted from dynamic to basic. For example, if the disk you want to convert to basic contains any volumes that are only supported by dynamic disks (all volume types except Simple volumes), then you will be warned here about the possible damage to the data involved in the conversion.
2. Click **OK** to add the pending dynamic to basic disk conversion operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

After the conversion the last 8 MB of disk space is reserved for the future conversion of the disk from basic to dynamic.

In some cases the possible unallocated space and the proposed maximum volume size might differ (for example, when the size of one mirror establishes the size of the other mirror, or the last 8 MB of disk space is reserved for the future conversion of the disk from basic to dynamic).

Boot disk conversion

The program does not require an operating system reboot after dynamic to basic conversion of the disk, if:

1. There is a single Windows Vista, or Windows 7 operating system installed on the disk.
2. The machine runs this operating system.

Caution: *The conversion of a disk containing boot volumes takes a certain amount of time. Any power loss, unintentional turning off of the machine or accidental pressing of the* ***Reset*** *button during the procedure could result in bootability loss.*

The program ensures:

- the **bootability** of each of the operating systems, for machines where more than one operating system is installed
- safe conversion of a dynamic disk to basic when it contains volumes **with data** for simple volumes.

6.7 Changing a disk status: online to offline

Effective for Windows Vista SP1, Windows 7 operating systems and applies to the current disk layout (p. 19).

The online status means that a basic or dynamic disk is accessible in the read-write mode. This is the normal disk status. You may need to change an online disk to offline in order to protect it from unintentional use, for example a disk is corrupted or has bad sectors.

To make a disk offline

1. Right click the online disk, and then click **Change status to offline**.
2. In the appearing window, click **OK** to confirm the operation.

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When taking a dynamic disk whose volumes span across several disks offline, these volumes get statuses with respect to their type: Simple/Spanned/Striped volumes become **Failed**; Mirrored volumes become **Failed Redundancy**. The disk you took offline also becomes **Missing**. To recover Simple/Spanned/Striped volumes it is enough to take the offline disk to online (p. 46). To recover Mirrored volumes, you need to take the offline disk online, and then reactivate it.

For information on how to bring a disk that is offline and missing back online, please refer to the following Microsoft knowledge base article: http://technet.microsoft.com/en-us/library/cc732026.aspx.

6.8 Changing a disk status: offline to online

Effective for Windows Vista SP1, Windows 7 operating systems and applies to the current disk layout (p. 19).

The offline status means that a dynamic disk is accessible in the read-only mode. You may need to change an offline disk to online to make the disk that you switched to offline previously fully accessed.

To make a disk online

1. Right click the offline disk, and then click **Change status to online**.
2. In the appearing window, click **OK** to confirm the operation.

*If the dynamic disk has the offline status and the disk's name is **Missing**, this means that the disk cannot be located or identified by the operating system. It may be corrupted, disconnected, or powered off. For information on how to bring a disk that is offline and missing back online, please refer to the following Microsoft knowledge base article: http://technet.microsoft.com/en-us/library/cc732026.aspx.*

6.9 Importing foreign disks

On a machine with two or more operating systems, representation of disks and volumes depends on which operating system is currently running.

Normally, all dynamic disks created within the same machine and operating system are members of the same disk group. When moved to another machine, or added to another operating system on the same machine, a disk group is considered as **foreign.** Foreign group disks cannot be used until they are imported into the existing disk group. A foreign group is imported as is (will have the original name) if no disk group exists on the machine.

To access data on foreign disks, you have to add these disks to your machine's system configuration using the **Import foreign disks** operation.

All dynamic disks of the foreign disk group are imported at the same time, you cannot import just one dynamic disk.

To import foreign disks

1. Right-click one of the foreign disks, and then click **Import foreign disks**.

   The appearing window lists all foreign dynamic disks that were added to the machine, and displays information about volumes that will be imported. Volume statuses lets you detect whether you are importing all the required disks of the disk group. When importing all the required disks, all their volumes have the **Healthy** status. Statuses other than **Healthy** indicate that not all of the disks were imported.

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For more information on volume statuses please refer to the following Microsoft article: http://technet.microsoft.com/en-us/library/cc771775.aspx

2. Click **OK** to add the pending foreign disks importing operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

6.10 Removing a missing disk

The **Missing** status occurs on a dynamic disk when the disk has been corrupted, turned off, or disconnected. The Logical Disk Manager (LDM) database keeps information about the missing disk because such disk might contain parts of dynamic volumes, such as mirrored volumes, that can be repaired.

If the disk can be reconnected or turned on, all you need to recover its functionality is to reactivate the disk. For information on how to bring a disk that is offline and missing back online, please refer to the following Microsoft knowledge base article: http://technet.microsoft.com/en-us/library/cc732026.aspx.

If the missing disk cannot be reactivated, or you would like to completely delete this disk from disk group, you can remove the disk from the LDM database.

Before removing a missing disk you have to delete (p. 31) all the volumes on the disk. However, if the disk contains any mirrored volumes, you can save them using the Remove mirror (p. 36) operation, instead of deleting the entire volume.

To remove a missing dynamic disk

1. Right-click the disk with the **Missing** status, and then click **Remove missing disk**.
2. Click **OK** to add the pending disk removal operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

6.11 Cleaning up a disk

This operation erases all volumes and data on a disk, making it not initialized. All volumes, even those spanning across other disks, are erased from the disks and the space that was occupied by these volumes becomes unallocated space. To be able to use the cleared up disk, you need to initialize (p. 41) it once again.

To clean up a disk

1. Right-click the disk you need to clean up, and then click **Clean up disk**.
2. Click **OK** to add the pending disk clean up operation.

The results of the pending operation are immediately displayed as if the operation had been performed.

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To perform the pending operation you will have to commit it (p. 20). Exiting the program without committing the pending operations will effectively cancel them.

Note: If you accidentally cleared an MBR disk with important data, it is still possible to recover the volumes on this disk by using Acronis Recovery Expert (p. 56). But do not forget to initialize the disk and set MBR partitioning scheme first.

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7 Tools

This section describes Acronis Bootable Media Builder and Acronis Recovery Expert tools.

After reading this section, you will have learned how to create bootable media in order to use Acronis Disk Director on bare metal or outside of an operating system, and how to recover deleted or lost volumes.

In this section

Acronis Bootable Media Builder 49
Acronis Recovery Expert 56
Acronis OS Selector 58
Acronis Disk Editor 73

7.1 Acronis Bootable Media Builder

Acronis Disk Director has a bootable version that can run from bootable media without booting an operating system.

Bootable media is physical media (CD, DVD, USB drive or other media supported by a machine BIOS as a boot device) that boots on any PC-compatible machine and enables you to run Acronis Disk Director either in a Linux-based environment or Windows Preinstallation Environment (WinPE), without the help of an operating system. You can create bootable media using Acronis Bootable Media Builder. Acronis Bootable Media Builder also provides the ability to create an ISO image of a bootable disc on a hard disk.

There are situations in which you might prefer to run Acronis Disk Director from bootable media. For example:

- to use Acronis Disk Director on a non-Windows systems, like Linux
- if you do not often use Acronis Disk Director and therefore do not want to install it on the machine
- to access the data that has survived in a corrupted system
- to create basic or dynamic volumes on bare metal
- to perform offline operations on a boot volume that cannot be done online because of restricted access, being permanently locked by the running applications or for any other reason.

If you have other Acronis products, such as Acronis True Image Home, installed on your machine, you can also include bootable versions of these programs on the same bootable media.

Linux-based bootable media

Linux-based media contains bootable version of Acronis Disk Director based on Linux kernel. It can boot and perform operations on any PC-compatible hardware, including bare metal and machines with corrupted or non-supported file systems.

PE-based bootable media

PE-based bootable media contains a minimal Windows system called Windows Preinstallation Environment (WinPE) and Acronis Plug-in for WinPE, that is, a modification of Acronis Disk Director that can run in the preinstallation environment.

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WinPE proved to be the most convenient bootable solution in large environments with heterogeneous hardware.

Advantages:

- Using Acronis Disk Director in Windows Preinstallation Environment provides more functionality than using Linux-based bootable media. Having booted PC-compatible hardware into WinPE, you can use not only Acronis Disk Director, but also PE commands and scripts and other plug-ins you've added to the PE.
- PE-based bootable media helps overcome some Linux-related bootable media issues such as support for certain RAID controllers or certain levels of RAID arrays only. Media based on PE 2.x or PE 3.0 allows for dynamic loading of the necessary device drivers.

7.1.1 How to create bootable media

To enable creating physical media, the machine must have a CD/DVD recording drive or allow a flash drive to be attached. Bootable Media Builder can also create an ISO image of a bootable disk to burn it later on a blank disk.

Linux-based bootable media

Start the Bootable Media Builder either from the management console, by selecting **Tools > Create Bootable Media** or, as a separate component.

1. In the **Bootable media type**, choose **Linux-based**.
2. Select the way volumes and network resources will be handled—called the media style:
   - A media with **Linux-like** style volume handling displays the volumes as, for example, hda1 and sdb2. It tries to reconstruct MD devices and logical (LVM) volumes before starting a recovery.
   - A media with **Windows-like** style volume handling displays the volumes as, for example, C: and D:. It provides access to dynamic (LDM) volumes.
3. The wizard will guide you through the necessary operations. Please refer to Linux-based bootable media (p. 51) for details.

PE-based bootable media

Acronis Plug-in for WinPE can be added to WinPE distributions based on any of the following kernels:

- Windows Vista (PE 2.0)
- Windows Vista SP1 and Windows Server 2008 (PE 2.1)
- Windows 7 (PE 3.0)

To be able to create or modify PE 2.x or 3.0 images, install Bootable Media Builder on a machine where Windows Automated Installation Kit (AIK) is installed. The remaining operations are described in the Adding the Acronis Plug-in to WinPE 2.x or 3.0 (p. 53) section.

If you do not have a machine with WAIK, prepare as follows:

1. Download and install Windows Automated Installation Kit (WAIK).

   Automated Installation Kit (AIK) for Windows Vista (PE 2.0):

   http://www.microsoft.com/Downloads/details.aspx?familyid=C7D4BC6D-15F3-4284-9123-679830D629F2&displaylang=en

   Automated Installation Kit (AIK) for Windows Vista SP1 and Windows Server 2008 (PE 2.1):

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http://www.microsoft.com/downloads/details.aspx?FamilyID=94bb6e34-d890-4932-81a5-5b50c657de08&DisplayLang=en

Automated Installation Kit (AIK) for Windows 7 (PE 3.0):

http://www.microsoft.com/downloads/details.aspx?familyid=696DD665-9F76-4177-A811-39C26D3B3B34&displaylang=en

2. [optional] Burn the WAIK to DVD or copy to a flash drive.
3. Install the Microsoft .NET Framework v.2.0 from this kit (NETFXx86 or NETFXx64, depending on your hardware.)
4. Install Microsoft Core XML (MSXML) 5.0 or 6.0 Parser from this kit.
5. Install Windows AIK from this kit.

It is recommended that you familiarize yourself with the help documentation supplied with Windows AIK. To access the documentation, select **Microsoft Windows AIK > Documentation** from the start menu.

7.1.1.1 Linux-based bootable media

When using the media builder, you have to specify:

1. [optional] The parameters of the Linux kernel. Separate multiple parameters with spaces.

   For example, to be able to select a display mode for the bootable Acronis Disk Director each time the media starts, type: **vga=ask**

   For a list of parameters, see Kernel parameters (p. 51).
2. The Acronis bootable components to be placed on the media:
   - **Acronis Disk Director**

     Bootable version of the product that has almost the same functionality as in the Acronis Disk Director for Windows operating systems — see Working under bootable media (p. 54) for details.
3. [optional] The timeout interval for the boot menu plus the component that will automatically start on timeout.
   - If not configured, the Acronis loader waits for someone to select whether to boot the operating system (if present) or the Acronis component.
   - If you set, say, **10 sec.**, Acronis Disk Director will launch 10 seconds after the menu is displayed.
4. The type of media to create. You can:
   - create CD, DVD or other bootable media such as removable USB flash drives if the hardware BIOS allows for boot from such media
   - build an ISO image of a bootable disc to burn it later on to a blank disc
5. Path to the media ISO file.

Kernel parameters

This window lets you specify one or more parameters of the Linux kernel. They will be automatically applied when the bootable media starts.

These parameters are typically used when experiencing problems while working with the bootable media. Normally, you can leave this field empty.

You also can specify any of these parameters by pressing F11 while in the boot menu.

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Parameters

When specifying multiple parameters, separate them with spaces.

acpi=off

Disables Advanced Configuration and Power Interface (ACPI). You may want to use this parameter when experiencing problems with a particular hardware configuration.

noapic

Disables Advanced Programmable Interrupt Controller (APIC). You may want to use this parameter when experiencing problems with a particular hardware configuration.

vga=ask

Prompts for the video mode to be used by the bootable media's graphical user interface. Without the **vga** parameter, the video mode is detected automatically.

vga=*mode_number*

Specifies the video mode to be used by the bootable media's graphical user interface. The mode number is given by *mode_number* in the hexadecimal format—for example: **vga=0x318**

Screen resolution and the number of colors corresponding to a mode number may be different on different machines. We recommend using the **vga=ask** parameter first to choose a value for *mode_number*.

quiet

Disables displaying of startup messages when the Linux kernel is loading, and starts the management console after the kernel is loaded.

This parameter is implicitly specified when creating the bootable media, but you can remove this parameter while in the boot menu.

Without this parameter, all startup messages will be displayed, followed by a command prompt. To start the management console from the command prompt, run the command: **/bin/product**

nousb

Disables loading of the USB (Universal Serial Bus) subsystem.

nousb2

Disables USB 2.0 support. USB 1.1 devices still work with this parameter. This parameter allows you to use some USB drives in the USB 1.1 mode if they do not work in the USB 2.0 mode.

nodma

Disables direct memory access (DMA) for all IDE hard disk drives. Prevents the kernel from freezing on some hardware.

nofw

Disables the FireWire (IEEE1394) interface support.

nopcmcia

Disables detection of PCMCIA hardware.

nomouse

Disables mouse support.

*module_name***=off**

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Disables the module whose name is given by *module_name*. For example, to disable the use of the SATA module, specify: **sata_sis=off**

pci=bios

Forces the use of PCI BIOS instead of accessing the hardware device directly. You may want to use this parameter if the machine has a non-standard PCI host bridge.

pci=nobios

Disables the use of PCI BIOS; only direct hardware access methods will be allowed. You may want to use this parameter when the bootable media fails to start, which may be caused by the BIOS.

pci=biosirq

Uses PCI BIOS calls to get the interrupt routing table. You may want to use this parameter if the kernel is unable to allocate interrupt requests (IRQs) or discover secondary PCI buses on the motherboard.

These calls might not work properly on some machines. But this may be the only way to get the interrupt routing table.

7.1.1.2 Adding the Acronis Plug-in to WinPE 2.x or 3.0

Bootable Media Builder provides three methods of integrating Acronis Disk Director with WinPE 2.x or 3.0:

- Adding the Acronis Plug-in to the existing PE ISO. This comes in handy when you have to add the plug-in to the previously configured PE ISO that is already in use.
- Creating the PE ISO with the plug-in from scratch.
- Adding the Acronis Plug-in to a WIM file for any future purpose (manual ISO building, adding other tools to the image and so on).

To be able to perform any of the above operations, install Bootable Media Builder on a machine where Windows Automated Installation Kit (WAIK) is installed. If you do not have such machine, prepare as described in How to create bootable media (p. 50).

Bootable Media Builder supports only x86 WinPE 2.x or 3.0. These WnPE distributions can also work on x64 hardware.

A PE image based on Win PE 2.0 requires at least 256MB RAM to work. The recommended memory size for PE 2.0 is 512MB. A PE image based on Win PE 3.0 requires at least 512MB RAM to work.

Adding Acronis Plug-in to WinPE 2.x or 3.0 ISO

To add Acronis Plug-in to WinPE 2.x or 3.0 ISO:

1. When adding the plug-in to the existing Win PE ISO, unpack all files of your Win PE ISO to a separate folder on the hard disk.
2. Start the Bootable Media Builder either by selecting **Tools > Create Bootable Media** or, as a separate component.
3. Select **Bootable media type: Windows PE**.

   When creating a new PE ISO:

   - Select **Create Windows PE 2.x or 3.0 automatically**
   - The software runs the appropriate script and proceeds to the next window.

   When adding the plug-in to the existing PE ISO:

   - Select **Use WinPE files located in the folder I specify**

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- Specify the path to the folder where the WinPE files are located.

4. [optional] Specify Windows drivers to be added to Windows PE. Once you boot a machine into Windows PE, the drivers can help you access the device where the backup archive is located. Click **Add** and specify the path to the necessary *.inf file for a corresponding SCSI, RAID, SATA controller, network adapter, tape drive or other device. You will have to repeat this procedure for each driver you want to be included in the resulting WinPE boot media.
5. Choose whether you want to create ISO or WIM image.
6. Specify the full path to the resulting image file including the file name.
7. Check your settings in the summary screen and click **Proceed**.
8. Burn the .ISO to CD or DVD using a third-party tool or copy to a flash drive.

Once the machine boots into WinPE, Acronis Disk Director starts automatically.

To create a PE image (ISO file) from the resulting WIM file:

- replace the default boot.wim file in your Windows PE folder with the newly created WIM file. For the above example, type:

```
copy c:\AcronisMedia.wim c:\winpe_x86\ISO\sources\boot.wim
```

- use the **Oscdimg** tool. For the above example, type:

```
oscdimg -n –bc:\winpe_x86\etfsboot.com c:\winpe_x86\ISO
c:\winpe_x86\winpe_x86.iso
```

For more information on customizing Windows PE, see the Windows Preinstallation Environment User's Guide (Winpe.chm).

7.1.2 Working under bootable media

Operations on a machine booted with bootable media are almost the same as operations in the running operating system. The difference is as follows:

1. The Check volume (p. 37) and Defragment volume (p. 37) operations are not available under bootable media.
2. Specify the disk layout (p. 19), if two or more Windows operating systems installed on the machine. If only one Windows operating system is installed, the disk layout of this operating system will be used. For bare metal, or if no Windows operating system is found, the disk layout will be used according to the bootable media environment (Linux-based or Windows PE).
3. The Linux-based bootable media shows local disks and volumes as unmounted (sda1, sda2...).
4. The log lifetime is limited to the current session. You can save the entire log or the filtered log entries to a file.

7.1.2.1 Setting up a display mode

For a machine booted from media, a display video mode is detected automatically based on the hardware configuration (monitor and graphics card specifications). If, for some reason, the video mode is detected incorrectly, do the following:

1. In the boot menu, press F11.
2. Add the following command to the command prompt: **vga=ask**, and then proceed with booting.
3. From the list of supported video modes, choose the appropriate one by typing its number (for example, **318**), and then press ENTER.

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If you do not wish to follow this procedure every time you boot from media on a given hardware configuration, re-create the bootable media with the appropriate mode number (in our example, **vga=0x318**) typed in the **Kernel parameters** window—see Linux-based bootable media (p. 51) for details.

7.1.2.2 List of commands and utilities available in Linux-based bootable media

Linux-based bootable media contains the following commands and command line utilities, which you can use when running a command shell. To start the command shell, press CTRL+ALT+F2 while in the bootable media's management console.

Linux commands and utilities

busybox	fxload	ls	pktsetup	strace
cat	gawk	lspci	poweroff	swapoff
cdrecord	gpm	lvm	ps	swapon
chmod	grep	mc	raidautorun	sysinfo
chown	growisofs	mdadm	readcd	tar
chroot	grub	mkdir	reboot	tune2fs
cp	gunzip	mke2fs	rm	udev
dd	halt	mknod	rmmod	udevinfo
df	hexdump	mkswap	route	udevstart
dmesg	hotplug	more	scp	umount
dmraid	ifconfig	mount	scsi_id	uuidgen
e2fsck	init	mtx	sed	vconfig
e2label	insmod	mv	sg_map26	vi
echo	iscsiadm	parted	sh	zcat
egrep	kill	pccardctl	sleep	
fdisk	kpartx	ping	ssh	
fsck	ln	pktsetup	sshd	

7.2 Acronis Recovery Expert

Acronis Recovery Expert is an easy-to use tool that lets you recover volumes on a basic MBR disk that were accidentally deleted or damaged due a hardware or software failure.

In case your volumes are damaged and the machine fails to boot—for example, after a power outage or a system error—use the bootable version of Acronis Disk Director and run Acronis Recovery Expert. It will help you to recover boot sectors and partition tables on hard disks and make your system bootable again.

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The Recovery Expert first attempts to recover volumes "as is", i.e. logical volumes will be recovered as logical and primary as primary respectively. If the primary volume cannot be recovered as is, it will be recovered as logical. Also, if the logical volume cannot be recovered as is, it will be recovered as primary.

To run Acronis Recovery Expert

Select **Tools > Acronis Recovery Expert** from the top menu.

Recovering volumes in automatic mode

The automatic mode is easy to use and requires minimal effort. The program will try to find and recover all the deleted volumes on all basic disks.

1. In the **Recovery mode** window, choose **Automatic**.
2. In the **Searching for deleted volumes** window, Acronis Recovery Expert scans all the basic disks for deleted volumes. First, Acronis Recovery Expert checks your disks for unallocated space. If there is no unallocated space, you will be asked to close the Recovery Expert. If unallocated space is found, then the Recovery Expert starts searching for traces of deleted volumes.

   The Recovery Expert checks the beginning of each side of every cylinder of every disk for boot sectors. A boot sector is the first sector of a volume that contains information about this volume, even after its deletion. Once a deleted volume is found, it will be displayed in the volume list. The search will, however, continue until all the remaining disks are scanned. Only after the search is completed, the **Next** button becomes enabled, and you can proceed to the next window.

   ***Note**: you cannot select volumes to recover in the automatic mode. Acronis Recovery Expert will recover all the discovered deleted volumes.*

   If the search is completed with no result, you will be asked to either perform the search using the **Complete** method, or to finish searching and close the application. With the complete method, the program scans each sector on every hard disk. It is more thorough and may take a long time to perform. If there are no volumes found with the complete method, you will be asked to close the Recovery Expert.
3. The **Recovered Volumes** window displays the volumes to recover as a part of the hard disk volume structure. Make sure that all the required volumes are properly placed in the hard disk structure, and then click **Next**.
4. Click **Proceed** to start recovering the volumes.

Recovering volumes in manual mode

The manual recovery mode lets you take full advantage of the volume recovery. You will be able to specify the searching method, disks to search on, and volumes to recover.

1. In the **Recovery mode** window, choose **Manual**.
2. In the **Unallocated Space Selection** window, select unallocated space on basic disks where the deleted volumes used to be located. If you are not sure about the location of the deleted volumes, select all the unallocated spaces on all the basic disks.
3. In the **Searching Method** window, choose:
   - **Fast** – (recommended) checks the beginning of each side of every cylinder of the selected disks. It takes less time, and should find all deleted volumes in most cases.
   - **Complete** – checks every sector on the selected disks for file system. It is more thorough and requires much more time to perform than the **Fast** method.
4. In the **Searching for deleted volumes** window, Acronis Recovery Expert scans all the selected hard disk drives for deleted volumes. Once a deleted volume is found, it will be displayed in the

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volume list. The search will, however, continue until all the remaining disks are scanned. If no volumes are found, you will be asked to close the Recovery Expert.

The program can even find and display intersected volumes, that is, volumes that were created and deleted on the disk at different times. Moreover, every successive volume allocates space from the previously deleted volume, but not at the beginning of it. Only one of the intersected volumes can be recovered.

Unlike the automatic recovery mode, you do not have to wait until the whole search is finished using the manual mode. As soon as a located volume or multiple volumes are added to the list, you can select them for immediate recovery. Selecting a volume changes its status to **Undeleted** and enables the **Next** button.

5. The **Recovered Volumes** window displays the volumes to recover as a part of the hard disk volume structure, marking them with an icon in the upper right corner of its rectangle. Make certain that all the selected volumes are properly placed in the hard disk structure, and then click **Next**.
6. Click **Proceed** to start recovering the volumes.

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8 Acronis OS Selector

Acronis OS Selector is a powerful, reliable and easy-to-use boot manager that allows several operating systems on a single machine and lets you create different configurations for any installed operating system, including Windows 7. With Acronis OS Selector, you can:

- Install several different operating systems on a single machine
- Load installed operating systems from any basic MBR disk volume or boot the machine from CD/DVD
- Load installed operating systems from under Windows
- Install several operating systems on a single volume
- Hide or protect any operating system on your machine with a password
- Duplicate installed operating systems and define different configurations for each copy

In this section

Starting the work 58
Setting the boot menu 59
Operations.....59
Editing operating systems.....63
Detecting operating systems 65
Setting Acronis OS Selector options.....65
Installing and using several operating systems on a single machine.....67

8.1.1 Starting the work

After Acronis OS Selector is installed together with Acronis Disk Director, all operating systems that exist on the given machine will be automatically located and added to the boot menu. The software will also automatically set the parameters and properties for every operating system found — see Setting operating system properties (p. 61).

You can run Acronis OS Selector as a separate application by clicking **Start** -> **All Programs** -> **Acronis** -> **Disk Director** -> **Acronis OS Selector**

You can control Acronis OS Selector in two ways:

- From its main window under Windows
- From the Acronis OS Selector boot menu invoked at bootup before the operating system is booted. The boot menu has the same interface and structure as the main window.

The key part of the main window, **Operating systems**, contains a list of operating systems available for loading on this machine. Acronis OS Selector automatically determines all operating systems installed and lists them in the boot menu at machine bootup and in the Acronis OS Selector main window under Windows. If you insert a bootable CD/DVD, it will be detected and displayed in the boot menu/main window as well. The CD/DVD can contain an operating system or any bootable program – in all cases, you will see a new icon in the operating systems area.

The left part of the window (the sidebar) contains the following sections also available in the main menu and customizable toolbar:

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Operations

This section includes actions available for selected operating systems or their shortcuts — see Using shortcuts (p. 64).

- **Boot** – boots the selected operating system or its configuration (shortcut)
- **Set Default** – sets the default operating system
- **Set password** – protects the selected operating system with a password
- **Properties** – sets properties of the selected operating system

Edit

This section provides the following means of operating system and shortcut management:

- **Hide** – hides a selected operating system or shortcut from the boot menu
- **Create Shortcut** – creates a shortcut for a selected operating system
- **Delete** – deletes a selected operating system or shortcut
- **Rename** – renames a selected operating system or shortcut
- **Copy** – duplicates a selected operating system or shortcut

Tools

- **Activate OS Selector** – select to always display the Acronis OS Selector boot menu at bootup
- **Deactivate OS Selector** – select to always boot up the specified operating system
- **OS Detection Wizard** – invokes OS Detection Wizard for detecting deleted or not-determined-automatically operating systems
- **Options** – sets Acronis OS Selector options

Details

This section provides brief context help on the selected operating system or its shortcut.

8.1.2 Setting the boot menu

After Acronis OS Selector is installed, the boot menu is automatically activated.

If your CD/DVD drive is set as the first bootup device in BIOS, a bootable CD/DVD inside the drive may prevent Acronis OS Selector from starting at bootup and force loading its own bootable program or operating system. We highly recommend that you set the system bootup sequence in BIOS so that the HDD will be the first device.

To prevent the Acronis OS Selector boot menu from being invoked at bootup, select **Deactivate OS Selector** in the **Tools** section of the Acronis OS Selector main menu under Windows or in the respective boot menu section at machine bootup. Then you will be prompted to select an operating system to be booted after the boot menu is deactivated.

You can avoid displaying the Acronis OS Selector boot menu at bootup even if OS Selector is active. To do so, press **F6** immediately after turning on the computer, before the first messages appear on the screen. This will boot an OS from the volume that is active, according to Master Boot Record (MBR).

8.1.3 Operations

This section describes operations available for selected operating systems or their shortcuts.

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8.1.3.1 Booting operating systems

You can boot any operating system with Acronis OS Selector:

- From the boot menu (if activated)
- From under Windows from the Acronis OS Selector main window

Booting an OS using the boot menu

Having turned on the machine, wait for the Acronis OS Selector boot menu to be invoked and select and double-click an operating system to boot.

You can also boot a selected OS by:

- Clicking **Boot** in the **Operations** section of the boot menu sidebar
- Clicking **Boot** on the toolbar
- Selecting **Boot** in the **OS** section of the main menu

Booting an OS from the Acronis OS Selector main window

With Acronis OS Selector, you can boot an available operating system from under Windows by:

- Running Acronis OS Selector
- Double-clicking the operating system icon in the central part of the main window

You will be prompted to reboot. Click **OK** to confirm and continue.

If you select the same operating system you are in at the moment, the machine will reboot after your confirmation.

You can also boot the selected OS using:

- The **Boot** button in the Operations section of the Main Window
- The **Boot** button on the toolbar
- The **Boot** item in the **OS** section of the main menu

8.1.3.2 Setting an operating system as the default

Any operating system can be set as the default. This means it will already be selected when the boot menu is invoked.

If you install a new operating system after Acronis OS Selector installation, it will be set as the default automatically.

You can set an operating system as the default by clicking **Set default** in the **Operations** section of the sidebar or the respective item in the **OS** section of the main menu, or the respective item of the context menu invoked by a right-click.

8.1.3.3 Setting operating system passwords

If needed, you can protect any installed operating system with a password to prevent its unauthorized booting.

To set a password

- Select an operating system to protect

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- Click **Set Password** in the **Operations** section of the main window sidebar
- Enter and confirm a password in the **Set Operating System Password** dialog and click **OK**.

An operating system password must be at least six characters long.

You can also set an operating system password by clicking **Set Password** on the toolbar, in the **OS** section of the main menu, or in the context menu, invoked by a right-click.

8.1.3.4 Setting operating system properties

Acronis OS Selector automatically determines properties of all operating systems installed on a machine. If needed, you can set them manually by clicking **Properties** in the **Operations** section of the main window sidebar, boot menu, the respective main menu, toolbar or context menu items.

General properties

This section allows you to change the name and icon for any operating system listed in the boot menu.

Boot configuration

This section allows you to set the following boot parameters:

- **Write Boot Sector** – write boot sector each time an operating system boots
- **Boot as MS-DOS 7.1** – can be set for operating systems compatible with MS-DOS 7.1+ that were not automatically located by Acronis OS Selector
- **Boot as OS/2** – can be set for operating systems compatible with OS/2 that were not automatically located by Acronis OS Selector
- **Enable large disks support** – enables large disks support for Windows 98/Me operating systems only.

Partitions

Acronis OS Selector allows you to hide hard disk volumes (except for the system). To hide a volume, select it and enable the **Hidden** option for it. This is not applicable to Windows 2000 volumes. You can perform this operation under that operating system using the **Advanced** section.

Disks

Generally, Windows can boot from the HDD only if its boot files reside on the first (according to BIOS) hard disk — see Installing and using several operating systems on a single machine (p. 67). If you connect a live system HDD, taken from another computer (where it was the first disk), to your computer, where it becomes the second (3rd etc.) disk, boot from that HDD will be impossible, even if the hardware is identical on both computers. OS Selector can manage situations like that and automatically set the disk order required for booting the selected operating system.

Moreover, you can choose the disk order when installing a new Windows operating system so that its boot files are installed on the same disk where its main part resides — see Installing another Windows OS on a different disk (p. 70). Doing so makes operating systems on your first, second and so on disks fully independent. You will be able, for example, to boot from the second disk even if the first one is damaged or disconnected. You also will be able to individually back up and restore each system disk: every operating system will be bootable when restored to its disk.

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Changing the disk order for an operation system already installed may prevent that system from loading.

Folders

Acronis OS Selector automatically determines system folders for all Windows operating systems. System folders contain files required for an operating system to work properly. Windows 2000/XP utilizes Windows, Program Files, and Documents and Settings folders, while Windows 7 uses Program Data, Users, and other folders.

For other operating systems (for example, Linux), you will have to specify system folders manually by using the **Add** button. If needed, you can edit the list by using the **Remove** button.

Under other operating systems (for example, Linux), you can add folders to the system folders list only if the host volumes are FAT16/32 or NTFS.

Each folder in the list has its **Properties** section which, with the help of the **Enable**/**Disable** parameter, allows you to specify if the folder contents are to be restored at operating system bootup. This can help avoid conflicts among multiple operating systems, making them invisible to each other. For example, you will have to enable system folders recovery when installing another Windows on a volume where one Windows operating system is already installed — see Installing another Windows on the same volume (p. 69). When you copy an operating system using the Acronis OS Selector **Copy** feature, the recovery option enables automatically.

- **Enable** – enable folder contents recovery at bootup;
- **Disable** – leave folder contents as is.

Files

This section allows you to specify the location of system files required by the given operating system and edit these files. Examples of system files might be **command.com**, **config.sys**, **msdos.sys**, and **autoexec.bat**.

For all Windows operating systems, the list of system files is populated automatically and can be changed, if needed.

Properties of system files will provide you with the following options:

- Automatic **deletion** of a selected file with Acronis OS Selector under the given OS. Check **Yes, delete when the operating system starts** to enable the option. This might become necessary when two system files are in conflict, causing possible OS bootup problems.
- During installation, Acronis OS Selector automatically determines system files of any Windows versions and makes them **Changeable**. You can change this option manually if needed.
- For operating systems that use FAT16/FAT32 file systems the IO.SYS file must be located in the starting 2 KB of the root folder. If you set a fragmentation limit for this file (in bytes), Acronis OS Selector will automatically defragment it when the limit is exceeded.

Advanced

You cannot hide a volume under a Windows 2000 operating system just by setting the Hidden (p. 63) options. To perform this operation, you will need to check the **Force hiding partitions** box available in this section.

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8.1.4 Editing operating systems

This section provides the means of operating system and shortcut management.

8.1.4.1 Hiding operating systems

If needed, you can hide any operating system installed so it will not be shown in the boot menu and **Operating systems** section of the OS Selector main window.

To hide an operating system

1. Select an operating system.
2. Click **Hide** in the **Edit** sidebar section, on the toolbar, or in the **Edit** section of the main menu. You can also hide an operating system using the context menu invoked by a right-click.

This will hide the selected operating system from the list of available ones.

To unhide an operating system

1. Select **Show Hidden** in the **View** section of the Acronis OS Selector main menu to see the list of all hidden operating systems in the lower part of the **Operating** systems window.
2. Select an operating system and click **Unhide** in the **Edit** sidebar section or select the respective items of the main menu (**Edit** section) or the context menu.

*If there are other operating systems on this list, you can hide them again by unselecting the **Show hidden** check box in the **View** section of the main menu.*

8.1.4.2 Using shortcuts

Acronis OS Selector allows you to create shortcuts for any operating system in the boot menu. Shortcuts enable you to create several different configurations for the same operating system.

Shortcut parameters are set in the same way as those of the operating system.

Shortcuts can be copied, deleted and renamed like operating systems.

You can create a shortcut for a selected operating system in the following ways:

- Clicking **Create shortcut** in the **Edit** sidebar section, main window toolbar or boot menu
- Clicking **Create Shortcut** in the **Edit** section of the main menu
- Clicking **Create Shortcut** on the toolbar
- Using a context menu invoked by a right-click

8.1.4.3 Deleting operating systems from the OS Selector boot menu

With the **Delete** operation, you can delete any operating system from the OS Selector boot menu and main window along with its shortcuts.

*You can delete all Windows system folders from the hard disk and at the same time delete Windows from the boot menu by selecting the **Delete the operating system directories** check-box in the **Confirmation** dialog window.*

8.1.4.4 Renaming operating systems

Acronis OS Selector users can assign any name to operating systems or their shortcuts. That can be done by clicking **Rename** on the sidebar, toolbar, main menu or context menu.

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8.1.4.5 Copying operating systems

Acronis OS Selector allows you to duplicate any installed operating system or its shortcut. It might be useful if you want to test unknown software before installing it on the main OS.

Copying an operating system implies duplicating all its system files and folders and configuration files, as well as all programs installed, into a separate folder located inside the hidden **BOOTWIZ** system folder — see Acronis OS Selector installation (p. 8).

Copying can take a long time, so you will be prompted to confirm that you want to perform the task.

To copy an operating system

1. Select an operating system in the boot menu or program main window
2. Click **Copy** in the **Edit** sidebar section or select a respective item in the main menu or context menu

After this, you will see a copy of this operating system in the **Operating systems** window with a number automatically appended to its name, depending on the number of copies already made. If needed, you can rename a copy by clicking **Rename** in the **Edit** sidebar section or selecting a respective item in the main menu or context menu.

8.1.5 Detecting operating systems

The OS detection tool allows an operating system that has been unintentionally deleted from the boot menu to be found and added to the Acronis OS Selector boot menu and main window. Besides, if an operating system on a newly connected disk was not detected automatically, you can try to add it to the boot menu using this tool.

A deleted Windows operating system cannot be detected if its system folders have been deleted from the hard disk. A deleted Linux system cannot be detected if its loader was located in the master boot record (MBR).

To run the OS Detection Wizard

1. Select the OS Detection Wizard from the **Tools** menu.
2. Select whether you want to detect an operating system on the hard disk, on CD, or to detect its record in the MBR.
3. If you selected the hard disk, select the partition where the operating system (to be exact, its boot part) is located. When detecting Linux, choose the partition containing Linux loader (for Windows — see Installing several Windows copies to a single machine (p. 68)). Then click **Bootable**.

   Whatever the location of the operating system selected, you can set options of available partitions, for example, hide some of them. These settings will be applied to the partitions each time you boot the detected operating system.
4. If you selected **Detect OS in MBR** or on a FAT hard disk partition, select if you want to use **Boot sector on partition** or **Boot sector in file**. Generally, the first setting will be enough. Having selected the second, you will have to specify a path to the file, containing a previously saved boot sector of the detected operating system.
5. Next, you will see a list of detected operating systems. Click **Finish** to add them to the Acronis OS Selector boot menu and main window.

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8.1.6 Setting Acronis OS Selector options

You can set Acronis OS Selector options by clicking **Options** in the **Tools** sidebar section or selecting a respective item on the Toolbar or main menu.

8.1.6.1 General options

Acronis OS Selector is able to protect system folders automatically when a new operating system is detected.

System folder protection is required when multiple operating systems are on a single machine, especially in situations when several operating systems are located on the same hard disk volume.

To choose a suitable configuration, click one of the options below:

- **Yes, protect folders** – folder protection will be enabled automatically when new operating systems are detected. Settings for the existing operation systems will be left intact.
- **No, do not protect folders** – Acronis OS Selector will not enable folder protection when new operating systems are detected.

8.1.6.2 Startup options

In this section, you can set Acronis OS Selector bootup behavior:

- **At once (ESC for menu)** – if activated, Acronis OS Selector will boot the default operating system and you will have to press **Escape** to enter the boot menu
- **With timeout** – if activated, the default operating system will be booted after an interval (in seconds.)
- **Disable** – you will have to manually select an operating system from the boot menu. This is active by default.

8.1.6.3 Display properties

Acronis OS Selector can control monitor video modes before Windows is booted and the graphics card and monitor drivers are loaded:

The following properties are available in the **Options** -> **Display** properties section:

- **Resolution** – you can manually set the resolution you want, provided that it is supported by your graphics card and monitor and ranges from VGA (640 x 480) to SXGA (1280 x 1024.)
- **Bit depth** – you can set the number of colors displayed, choosing among **Low** (8-bit, 256 colors); **Medium** (16-bit, 65,536 colors); and **High** (24-bit, 16,777,216 colors.)
- **Refresh rate** – you can manually set the display refresh rate, which is set to 60Hz by default. If you select **Optimal**, the program will determine your graphics configuration automatically and set the maximum available refresh rate. The maximum rate that can be set manually is 150Hz.

8.1.6.4 Passwords

You can set, change or remove Acronis OS Selector global passwords, including:

- Boot menu password – asked for each time Acronis OS Selector starts, except for cases when the boot menu is disabled to boot the default operating system immediately

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- Administrator password – required when a user tries to change any options and settings of Acronis OS Selector and operating systems

To disable global passwords, leave both input fields blank.

When the default operating system is booted without invoking the boot menu, you might have to enter the boot menu password running Acronis OS Selector under Windows.

8.1.6.5 Input devices

In this section of Acronis OS Selector options, you can provide extended support of input devices (mouse, etc.) in Acronis OS Selector boot menu.

Using the **Default** parameter, the program automatically determines installed input devices.

If needed, you can manually specify an input device to use:

- Mouse or compatible device (touch pad, TrackPoint or its notebook equivalent) on PS/2 or USB
- Mouse on COM1
- Mouse on COM2
- Do not use mouse

8.1.7 Installing and using several operating systems on a single machine

One of the key benefits offered by Acronis OS Selector is the ability to add almost any new operating system to a machine, even if it already has one or more operating systems installed. By using Acronis OS Selector, a user is able to install:

- Several different copies of the same operating system (for example, Windows 7);
- Different operating systems from the same developers (for example, Microsoft Windows Vista and Windows 7);
- Operating systems from various developers (for example, Windows and Linux).

In all cases, Acronis OS Selector eliminates software conflicts that might affect operating system stability and even result in failures.

Acronis OS Selector supports and automatically recognizes the following operating systems:

- Various DOS environments: MS DOS 5.x–6.x; MS DOS 7.0 (not a separate product but is included in Windows 95); MS DOS 7.1 (not a separate product but is included in Windows 98); MS DOS 8.0 (not a separate product but is included in Windows Me)
- All Windows operating systems: Windows 95/98/Me/NT/2000/XP/Vista/7
- The most popular Linux distributions
- The most popular Unix distributions: FreeBSD, Solaris, QNX

Below, you will find instructions for some of the most typical situations related to adding a second operating system to a machine that already has one installed. Please be aware that peculiarities of some operating systems may place additional limitations and/or require additional actions.

Please note that a newly installed operating system will be set as the default in the Acronis OS Selector boot menu. If you require another operating system to have this status, you will have to adjust the respective operating system properties — see Setting an operating system as the default (p. 60).

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8.1.7.1 Reactivating the Acronis OS Selector boot menu

Because operating systems can change the Master Boot Record (MBR) during installation, Acronis OS Selector, which also uses the MBR, might become inoperable.

If this happens, you will not have to reinstall Acronis OS Selector, but to reactivate it by selecting **Activate OS Selector** from the **Tools** menu of Acronis OS Selector.

Besides, automatic reactivation is provided for Windows 98 operating system. To do this, Acronis OS Selector adds a REINSTAL.COM launch line into AUTOEXEC.BAT that restores Acronis OS Selector MBR code. Still, if this program does not do the thing correctly, you can reactivate Acronis OS Selector manually.

It is impossible to perform automatic MBR recovery under Windows Millennium Edition, as this OS has a feature-limited version of MS DOS 8.0 that can't run programs from AUTOEXEC.BAT.

8.1.7.2 Installing several Windows copies to a single machine

General information

Any Windows operating system consists of two parts: bootable and main.

Windows 2000/XP has NTLDR OS core loader (a simple boot manager) that requires the BOOT.INI configuration file, NTDETECT.COM initial hardware detector, while Windows 7 has **bootmgr** loader that requires the **BCD** configuration file.

The main part of Windows operating system is located in Windows (or WINNT), Program Files, Documents and settings, or Users system folders that might be stored on any hard disk volume or even disk, while the bootable part is required to be located on the first hard disk primary volume.

The disk has to be the first, according to BIOS. This may vary from the enumeration that several operating systems provide. If there are several disks in the machine, you can see their enumeration in the Acronis Disk Director main window (p. 17). The first disk in the system is numbered 1.

Due to the location limitations of the bootable part, you can avoid problems with Windows only if you follow the installation sequence, according to which, older operating systems are to be installed first: Windows 2000 Professional -> Windows XP -> Windows Vista -> Windows 7.

This operating system installation sequence solves boot problems. Otherwise, boot files of a newer OS will be damaged by those of an older version of Windows that knows nothing of its subsequent versions.

Acronis OS Selector breaks this limitation and eliminates the need to worry about the Windows installation sequence.

Installing another Windows OS on a separate volume

1. Prepare a free primary volume for the new Windows system.

   You can do this by using unallocated space. For volume creation instructions see Creating a volume (p. 25). If there is no unallocated space, you can free up space by resizing respective volumes — see Resizing a volume (p. 27).

   Acronis Disk Director allows conversion of free logical volumes into primary — see Converting a logical volume to primary (p. 34). Still, you must remember that there cannot be more than four primary volumes in a system.

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2. Set the prepared volume active for the new operating system — see Setting a volume active (p. 35).

   When installing a new operating system from CD/DVD, select the **CD** item in the **Operating systems** area of the Acronis OS Selector main window.

   When installing a new operating system from floppy disks, create a new **Boot from floppy** item by selecting **OS** -> **New** -> **Boot from floppy** in the **Menu**.

   Then right-click on that item, select **Operating System Properties** -> **Partitions** from the context menu and flag the volume you want the operating system on as **Active**.
3. Reboot and select your CD/DVD or floppy bootup from the boot menu, having inserted the disk with the operating system distribution.
4. Once booted from the disk, follow the instructions to install the operating system. During installation, the Windows bootable part will automatically place itself on the primary volume you have previously set as active.

   When you boot either version of Windows using Acronis OS Selector later, each operating system in the list will recognize the volume where its bootable part is located as active.

Installing another Windows OS on the same volume

In some cases, you might want to install several operating systems onto the same volume. This is usually not possible due to system files conflicts, and even operating systems from the same developer require different volumes for installation.

Acronis OS Selector enables you to avoid this restriction easily by protecting system files and folders of various operating systems from each other.

To install a new operating system onto a volume where another Windows operating system exists, you need to do the following:

1. Select **Tools** -> **Options** -> **General options** and flag **Yes, protect folders**.
2. In the active operating system's **Properties**, select **Folders** and enable the restoring of each system folder's content at system start — see Folders (p. 62).
3. After that, system files and folders of an existing operating system will be stored in the BOOTWIZ folder and made inaccessible for other operating systems installed.
4. Reboot the machine to finish the configuration.
5. Start installing a new operating system in the ordinary way from a CD/DVD or from under Windows.

Installing another Windows OS on a different disk

To install a new Windows operating system onto a different disk, do the following:

1. When installing a new operating system from CD/DVD, select the **CD** item in the **Operating systems** area of the Acronis OS Selector main window.
2. When installing a new operating system from floppy disks, create a new **Boot from floppy** item by selecting **OS** -> **New** -> **Boot from floppy** in the **Menu**.
3. Then right-click on that item, select **Operating System Properties** -> **Disks** from the context menu and set the target disk, where the new operating system will be installed, to be the first.
4. Having inserted the disk with the operating system distribution, reboot and select your CD/DVD or floppy bootup from the boot menu.
5. Once booted from a disk, follow the instructions to install the operating system.

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By setting the target disk to be the first, you will force the boot part of Windows to be installed on that disk so that the new operating system can boot, even if the first disk is damaged or has been removed. However, you may choose not to do it. The new operating system will then boot from the first disk, in spite of its system folders residing on another disk.

Installing additional Windows copies

In some cases, you might need to install two copies of the same Windows operating system (for example, two or more Windows 7 copies, each having its own properties and application sets).

The first way to do it is to use one of the methods described above. These imply a complete OS installation.

The second way is simpler: operating system duplication using the **Operating system copy** feature described in detail in the Copying operating systems (p. 64) section of this guide. The program will fully duplicate contents of Windows, Program Files, Users, and Documents and Settings folders, including all software installed into the BOOTWIZ folder. You will then be able to remove unneeded applications from each of the systems.

However, keep in mind that the **Copy** feature does not allow copying an operating system onto a specified disk or volume.

New Operating System Wizard

If you installed a new copy of Windows on your machine, the New Operating System Wizard will help you set up its properties when you run the Boot menu of Acronis OS Selector for the first time.

Having installed a Windows operating system, you can either save or replace pre-existing Windows versions.

- If you need to update an existing Windows version with a new copy of Windows, select **Yes, update existing operating system**. In this case, the New Operating System Wizard will automatically determine Windows versions available for update.
- If you need to leave your existing Windows copies as is, select **No, add new operating system**. In this case, a new copy of Windows will be added to the list of available operating systems in the Boot menu.

If you chose to update the existing operating system, the New Operating System Wizard will automatically determine the list of operating systems installed that are available for update. In the list provided, select an operating system to update by replacing it with a new copy of Windows 2000/XP.

When a new operating system is configured, click **Proceed** to confirm the selected operations.

If Acronis OS Selector cannot automatically determine the location of the system folders, you will have to provide the information manually. System folders might be located on:

1) Any physical hard disks shown in the list

2) Any media unsupported by BIOS

8.1.7.3 Installing Linux and Windows on the same machine

The Linux operating system is a modern, reliable and high-performance platform for both business and home users. Since its popularity is growing, many Windows users are choosing to sample Linux;

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however, not all of them are willing to change operating systems completely or have a second machine on which to install Linux.

The preferred option is to run Windows and Linux on a single machine.

Linux peculiarities

From the perspective of bootup, Linux, like Windows, has two parts:

- A loader that loads the Linux core into memory and passes it the controls
- The main part of the operating system

The most popular Linux loaders are LILO and GRUB.

The main part of Linux is usually installed to an Ext2/Ext3 or ReiserFS file system volume that can either be primary or logical and can be located on any hard disk. This operating system needs another volume for its virtual memory (Linux Swap).

The Linux core is located in a file, which must be loaded into memory. Instead of supporting multiple file systems, LILO developers took a simpler, more universal route: a loader just keeps the core file location in its data structure created by the special activator program, “lilo”. Because this program runs under Linux, it can locate any file on a disk by means of the operating system.

A disadvantage of such a mechanism is evident when moving or reducing the size of a Linux bootable volume. In such cases, Linux stops booting.

Preparing volumes for Linux installation

Before you start installing Linux, you have to prepare volumes for it. Different Linux distributions may require a different volume structure, so you will have to follow the installation instructions of your specific distribution.

Acronis Disk Director provides the easiest mechanism for preparing volumes for further use, containing everything necessary for Linux file systems and volumes — see Creating a volume (p. 25). If there is no unallocated space, you can free it by resizing respective volumes — see Resizing a volume (p. 27).

Experienced Linux users can create volumes manually by means of their specific operating system installers.

Installing Linux

Having created volumes, you can start Linux installation from a bootable CD/DVD with Linux distribution created from images that are usually located on the first installation CD/DVD.

Because Linux is installed only into volumes prepared for it, there is no need to create any special properties for the new operating system to hide or change status of any volumes.

After selecting the loader location, you will have to remember that once placed into the MBR, the loader will overwrite the Acronis OS Selector boot record, making Acronis OS Selector inoperable until it is reactivated from the Acronis OS Selector boot menu (p. 68).

After Linux is installed, Acronis OS Selector will automatically detect its presence and create a respective customizable icon in the **Operating system** area of the main program window.

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8.2 Acronis Disk Editor

Acronis Disk Editor is a professional tool that performs a variety of actions on a hard disk: with it, you can restore boot records, repair files and folder structure, find lost clusters, remove computer virus code from a disk and much more. This program has much to offer to a computer novice as well. For example, it can be used as an educational tool.

Working with Acronis Disk Editor requires a thorough understanding of the hard disk structure, file systems, operating systems, partitioning schemes and principles of data storage organization. Complete instructions concerning the organization of data storage, and the interaction of hard disks with operating systems and applications, is not within the scope of these documentation.

When editing disks and volumes, you should be certain of your actions. You can easily violate a disk's information integrity by making data inaccessible. Also, your machine operability may be severely affected (the operating system will stop loading, applications will stop running).

In this section

Starting work with Acronis Disk Editor 73
Main window, menu and controls 74
Editing disks.....74
View.....75
Search.....76
Usage examples 76

8.2.1 Starting work with Acronis Disk Editor

To start Acronis Disk Editor

1. Connect the console to the machine where Acronis Disk Director Agent is installed.
2. In the disk management area, right-click a disk or volume, and then click **Edit**. This will start Acronis Disk Editor, providing access to its operations.

The difference between selecting the entire disk or selecting a volume is the following:

- if you select the entire disk you will be able to view and edit data storage structures of the entire disk – Partition table, File Allocation Table of all disk volumes, the root folder, data area.
- selecting a volume lets you view and edit only data storage structures of this volume – File Allocation Table, the root folder and data area of the volume.

8.2.2 Main window, menu and controls

The main window displays the numbers of disk and sector where the internal program cursor is positioned.

The menu of Acronis Disk Editor contains the following items:

- **Disk** – lets you browse properties of the selected disk.
- **Edit** – lets you manipulate blocks of selected hard disk volumes; also lets you to save the content of a disk sector after editing.
- **View** – lets you select a view mode for more convenient data presentation. By default, the main window of the program displays the selected volume or disk in the hexadecimal (Hex) mode.
- **Search** – lets you search a volume (or a hard disk) for any line (or any sequence of characters) and go to a certain disk sector according to its absolute offset.

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- **Help** – lets you get help concerning the editor window, the program's manufacturer and version.

Using controls

While all the operations can be accessed from the menu, the most frequently used operations are available on the **toolbar**.

You can access almost all of the program's main functions (or menu items) with the help of **F1**, **F2**,… **F10** keyboard shortcuts and combinations like **Ctrl+O**, **Ctrl+F**, **Alt+P**, etc. For example, the dialog window for searching volumes and/or hard disks for lines is performed by pressing the **Ctrl+F** key combination. You can go to a sector according its absolute offset by pressing **Alt+P**. You can switch between various main window view modes. For example, press **F2** for the As Hex view mode, **F6** for the As Partition Table view mode, **F7** for the As Boot Sector view mode. There are other available shortcut keys.

The **list of encodings** is used to interpret the hard disk sector content. Selecting the necessary encoding, will allow you to view the sector's content correctly interpreted in the right part of program's main window in the Hex mode.

8.2.3 Editing disks

The **Edit** menu lets you access the main operations with blocks of given hard disk sectors. You can edit hard disk data directly in the fields of any view mode — see View (p. 75).

Let us consider the disk editing in the **As Hex** view mode.

Selecting data

Any view mode lets you select blocks of disk sectors with the mouse or with the keyboard.

In the Hex view mode, use the following to select blocks:

- **With a mouse**. Place the mouse pointer at the necessary sector byte and drag it to create a block selection around the outside of all the bytes that you want to select.
- **With a keyboard**. Place the cursor at the necessary sector byte. Press and hold the **Shift** key and use the arrow keys (or **Page Up** and **Page Down** keys) to create a selection.

  Hint: *Pressing the **End** key while holding the **Shift** selects the entire disk sector. To select all the disk sectors, press **Ctrl+A**.*

Editing disk data

Point the cursor to the block that you need to edit in the hexadecimal or character area in the main window. Then, enter the required value. In other view modes, you should edit values in the appropriate fields.

Use the **Undo** menu item to discard the last one or more changes. **Undo all** discards all the changes you made.

Saving your changes

The changes you made will not be applied to the given disk sector immediately. Be sure to click **Save sector** for changes to take effect.

Attention*: After saving changes you will not be able to undo them.*

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If you do not save your changes, you effectively reject them. If you have made changes in a hard disk sector and decide to exit the editor without saving them, you will see a warning prompting you to save your changes.

Writing a block from a file

The **Write to file** menu item lets you to save the selected block to a file.

It is a good practice to save the selected blocks before you begin to edit them. This will help you to revert changes made to the given hard disk sectors and to restore the data.

To save a disk sector block to a file

1. Select the block that you need to save, and then click **Write to file**.
2. In the **Write to file** window, click **Browse** and specify the path and file name.
3. Click **OK** to save the file.

Tip: *You can create a selection right in the* ***Write to file*** *window: in the* ***Size*** *filed, specify the the number of bytes that will be selected from the current cursor position.*

Reading a block from a file

The **Read from file** menu item lets you read the block from a previously saved file and insert it into a disk sector.

To read a block from a file

1. Place the cursor to the necessary sector byte, and click **Read from file**.
2. In the **Read from file** window, click **Browse** and specify the file.
3. Click **OK.** The file content will be inserted to a sector from the current cursor position.
4. Click **Save sector (Ctrl+S)** to save changes.

8.2.4 View

Information about disks and volumes in the Acronis Disk Editor window can be viewed and edited in several different modes. You can select the appropriate view mode with the help of the **View** menu.

The editor offers seven view modes:

- HEX (hexadecimal mode)
- Partition table
- FAT16 boot sector
- FAT32 boot sector
- FAT32 FS info sector
- NTFS boot sector
- FAT folder

The hexadecimal view mode is the main and the most universal. Other modes that represent some kind of patterns for viewing data let you work with decoded values of bytes or groups of bytes. You will be able to see the stages of disk data storage formation while the standard disk volume is being created and formatted and while files and folders are being created.

Additionally, in the **View** menu, you can hide or show the status bar and toolbar.

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8.2.5 Search

The **Search** menu lets you search a disk for a line and to go to a disk sector according to its absolute offset.

A search line can be set both as char and as numeric (hexadecimal) values. During a search, you can ignore letter case as well as search for a given line at a given offset inside the sector.

The disk data is interpreted according to the encoding selected. If you selected a search mode without a matching case letter, both the case and elements above the characters will be ignored.

After the search process is finished, the current position will be moved to where a line was found, or will remain the same if no lines were found. You can search for the next line by pressing the **F3** key.

You can go to the necessary sector according to its absolute offset, by selecting the **Go to** menu item (or by pressing the **Alt+P** key combination).

The transition is performed by entering an absolute sector offset, or by entering cylinder, head and sector numbers. The listed parameters are bound by this expression:

(CYL x HDS + HD) x SPT + SEC – 1,

where CYL, HD and SEC are cylinder, head and sector numbers in the CHS coordinates (Cylinder – Head – Sector); HDS is the number of heads per disk and SPT is the number of heads per track.

You can return to a sector from another one by selecting the **Back** item in the **Search** menu (or by pressing the **Ctrl + B** key combination).

8.2.6 Usage examples

This section describes how to use Acronis Disk Editor for the most common scenarios.

8.2.6.1 Protecting and restoring MBR

This example applies to basic disks whose partitioning scheme is MBR.

The master boot record (MBR) is located in the first sector of the hard disk and stores information about the hard disk partitioning and code that is loaded with BIOS. Information stored in the MBR is crucial for the machine booting.

If the MBR code is corrupted due to boot sector viruses or human error, the machine becomes unbootable and you cannot access the data stored on the hard disks.

By having the MBR code copy saved in a safe place, you will protect your machine against such disasters. Even if your machine fails to boot normally, you can boot it by using bootable media created with Acronis Bootable Media Builder (p. 49). Under bootable media, you can start Acronis Disk Editor and restore the MBR from a previously saved copy. Thus, the machine bootability will be completely restored.

The following describes how you can save the MBR code copy and restore it in case failure.

Step 1. Saving MBR

1. In Acronis Disk Director right-click the disk whose MBR code you need to save, and then click **Edit**.
2. In Acronis Disk Editor press **F2** key to switch to the Hex view mode.

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3. Place the cursor at the very beginning of the first sector byte (Absolute sector 0, or 0000 in Hex). Then, hold down the **Shift** key and use the arrow keys to select the first 445 bytes of the sector. This will select the MBR code and disk signature.

   Tip. The exact cursor position is displayed in the **Position** field on the status bar (in the bottom-right corner of the window).
4. Select the **Write to file** item in the **Edit** menu.
5. In the **Write to file** window, click **Browse** and specify the path and file name.
6. Click **OK** to save the file.

Step 2. Restoring MBR

1. Create bootable media in order, to be able to restore the system in case of failure. Bootable media is created with Acronis Bootable Media Builder as described in How to create bootable media (p. 50).
2. Boot the machine with the bootable media and run Acronis Disk Director.
3. Right-click the disk whose MBR you need to restore and then click **Edit**.
4. In Acronis Disk Editor press **F2** key to switch to the Hex view mode.
5. Place the cursor at the very beginning of the first sector byte (Absolute sector 0, or 0000 in Hex), and then click **Read from file**.
6. In the **Read from file** window, click **Browse** and specify the file storing the MBR code.
7. Click **OK.** The file content will be inserted into a sector from the current cursor position.
8. Press **Ctrl+S** key combination to save changes.
9. Reboot the machine.

8.2.6.2 Copying the MBR to another disk

This example applies to basic disks whose partitioning scheme is MBR.

You need to copy the source disk's MBR code, if you move the system volume from this disk to a target disk that does not have MBR or has a different loader.

To copy the MBR to another disk

1. In Acronis Disk Director, right-click the source disk whose MBR code you need to copy, and then click **Edit**.
2. In Acronis Disk Editor, press the **F2** key to switch to the Hex view mode.
3. Place the cursor at the very beginning of the first sector byte (Absolute sector 0, or 0000 in Hex). Then, hold down the **Shift** key and use the arrow keys to select the first 445 bytes of the sector. This will select the MBR code and disk signature.

   Tip. The exact cursor position is displayed in the **Position** field on the status bar (in the bottom-right corner of the window).
4. Select the **Write to file** item in the **Edit** menu.
5. In the **Write to file** window, click **Browse** and specify the path and file name.
6. Click **OK** to save the file.
7. Press **Alt+F4** to quit Acronis Disk Editor.
8. In Acronis Disk Director, right-click the target disk where to copy the MBR code, and then click **Edit**.
9. In Acronis Disk Editor, press the **F2** key to switch to the Hex view mode.

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10. Place the cursor at the very beginning of the first sector byte (Absolute sector 0, or 0000 in Hex), and then click **Read from file**.
11. In the **Read from file** window, click **Browse** and specify the file storing the MBR code.
12. Click **OK.** The file content will be inserted into a sector from the current cursor position.
13. Press the **Ctrl+S** key combination to save changes.
14. Reboot the machine.

8.2.6.3 Wiping disk data

Hard disks can contain a substantial amount of confidential information. Often users forget that private information must be completely destroyed to avoid unauthorized access to it. Simply deleting an old file is not sufficient.

Windows tools do not guarantee data destruction. Deleted files can be restored easily. Formatting and even deleting a partition leaves hard disk sector contents the same.

Acronis Disk Editor can be used as a simple and reliable tool for complete wiping hard disk data.

To wipe disk data

1. In Acronis Disk Director, right-click the disk whose data you need to destroy, and then click **Edit**.
2. In Acronis Disk Editor, press the **F2** key to switch to the Hex view mode.
3. Place the cursor at the very beginning of the first sector byte (Absolute sector 0, or 0000 in Hex). Then, press the **Shift+Ctrl+End** key combination to select the rest of the disk sectors.
4. Click **Fill** and enter the *0* (zero) fill value.
5. Click **OK** and then confirm the operation.

Be careful! *After you confirm the operation, all the disk data will be deleted completely and you will not be able to recover it unless you have backups of this disk made with Acronis disk backup and recovery solutions.*

8.2.6.4 Restoring deleted files

Acronis Disk Editor can be used to restore deleted files even after the volume has been formatted or deleted.

A file can be restored only if:

- it was stored contiguously as a unit on this volume, i.e. the file should not be fragmented.
- it was not overwritten by another data.

Restoring files with Acronis Disk Editor is a bit tricky and requires some hex editor working skills. To restore a file, you need to obtain some distinctive information about it from the Hex view. This information will help you to locate the file when searching for it in Hex view.

The following example describes how to restore a couple of .jpeg images files from the formatted volume.

Prerequisites:

1. The files had been located on the volume My Data (G:) before it was formatted.
2. These images were taken by the certain type of camera.
3. Files were stored as units and they were not overwritten by another data.

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To restore files

1. In a file manager that supports Hex, open an existing .jpeg file similar to the deleted file. Our goal is to find some information that can be used to distinguish these .jpeg files among the other data stored on the volume.

   Lets open a similar .jpeg image that was taken with the same camera in Hex mode with the Western (Windows) encoding. As we can see in character area, this .jpeg file begins with something like:

   ```
   ...JFIF....H.H...
   ```

   and ends with something like:

   ```
   ...OLF...
   ```

   Normally, when taking a picture the camera writes information about the manufacturer in every .jpeg file. This information is usually stored at the beginning of every file. Thus, by knowing how the file begins and ends plus having information about the manufacturer, we have enough information to distinguish our .jpeg files.
2. In Acronis Disk Director, right-click the formatted volume G: that stored the file you need to restore, and then click **Edit**.
3. In Acronis Disk Editor, press the **F2** key to switch to the Hex view mode. Then, select the **Western (Windows)** encoding on the toolbar.
4. Press the **Ctrl+F** key combination. Then, enter *JFIF* in the search field. When this value is found, take a look at the lines below to see information about the camera manufacturer. If it does not contain the information that we are looking for, we should search for the next *JFIF* entry until we find the one we are looking for.
5. Once the required data is found, create a selection as follows.

   Select the beginning of the sector where the *JFIF* letter combination appears. Then hold down the **Shift** key and use the arrow keys (or **Page Up** and **Page Down** keys) to select the rest of sectors up to the end of the sector where the *OLF* letter combination is.
6. Select the **Write to file** item in the **Edit** menu.
7. In the **Write to file** window, click **Browse** and specify the path and file name. For example, *C:\image_1.jpeg*.
8. Click **OK** to save the file.
9. Open this file in any image viewer. If you see the image, then you did everything right. If you do not see the image, make sure that you select the image data exactly as described in step 5.

To restore another .jpeg file, repeat the steps 4–9.

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9 Glossary

A

Active volume

The volume from which a machine starts.

If no operating systems other than Windows are installed on your machine, the active volume is typically the same as the system volume (p. 91).

If an operating system other than Windows, such as Linux, is installed on your machine, the active volume can be the volume where the program known as a boot loader, such as GRUB, is stored.

The active volume is either a primary volume (p. 90) (on a basic disk) or a simple volume (p. 90) (on a dynamic disk).

Only one volume on a disk can be active.

The active volume on a basic disk is also called the active partition.

Allocation unit

See Cluster (p. 82).

B

Bad cluster

A cluster (p. 82) that contains one or more bad sectors (p. 81).

It is not possible to store data in or retrieve it from such cluster.

Bad sector

A sector (p. 90) that cannot store the information written in it—for example, due to physical defects or aging of the magnetic surface.

Basic disk

A disk that can be accessed by all versions of Windows, as well as by other operating systems.

A basic disk can store one or more volumes (p. 92), which are called basic volumes.

A basic disk can be converted to a dynamic disk.

Basic volume

A volume on a basic disk (p. 81).

A basic volume can be primary (p. 90) and logical (p. 87).

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Block

See Sector (p. 90).

Boot sector

The first sector (p. 90) of a disk (p. 83) or a volume (p. 92) that contains the initial code to start the operating system.

The boot sector must end with a hexadecimal signature of 0xAA55.

Boot volume

The volume which contains files that are necessary for a particular Windows operating system to start and work.

If only one Windows operating system is installed on your machine, the boot volume is usually the same as the system volume (p. 91).

If more than one Windows operating system is installed on your machine, each of these operating systems normally has its own boot volume, whereas there is still only one system volume.

In terms of volume type, a boot volume can be a primary or logical volume on a basic disk, or a simple volume on a dynamic disk.

See also system volume (p. 91).

Bootable media

A physical media (CD, DVD, USB flash drive or other media supported by a machine BIOS as a boot device) that contains a bootable version of Acronis Disk Director or Windows Preinstallation Environment (WinPE) with the Acronis Plug-in for WinPE.

A machine can also be booted into the above environments using the network boot from Acronis PXE Server or Microsoft Remote Installation Service (RIS). These servers with uploaded bootable components can also be thought of as a kind of bootable media.

Bootable media is most often used to create basic or dynamic volumes on bare metal.

Booting

The process of starting a machine when the machine is turned on or reset.

When the machine boots, its hardware runs a program known as a boot loader, which in turn starts the selected operating system.

A machine that cannot boot normally—for example, because a volume with the operating system is not available—is called unbootable.

Some operations, such as resizing the system volume in Windows, require rebooting the machine.

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C

Cluster

The unit of disk space allocation to store files in a file system.

Each non-empty file completely occupies one or more clusters.

The typical size of a cluster is 4 KB. When formatting a volume, you can choose the cluster size for it.

Smaller cluster sizes allow for more efficient storage of smaller files by reducing the amount of wasted disk space; but larger files may become more fragmented across the volume, which may increase the amount of time that is needed to access them.

A cluster is also known as an allocation unit.

Physically, a cluster is one or more (usually eight) sectors on a disk.

Cylinder

A group of all tracks (p. 92) on all magnetic platters of a hard disk (p. 87) that can be accessed without moving the magnetic head.

Access to the data inside one cylinder is much faster than moving the head from one cylinder to another.

D

Defragmentation

The process of rearranging files on a volume to reduce fragmentation (p. 86), which may improve file access times.

Disk

A storage device, often a magnetic storage medium, which is attached to a machine.

Examples of disks include hard disks and floppy disks.

Disk group

A number of dynamic disks that store the common configuration data in their Logical Disk Manager (LDM) databases and therefore can be managed as a whole.

Normally, all dynamic disks created within the same machine are members of the same disk group.

As soon as the first dynamic disk is created by the LDM or another disk management tool, the disk group name can be found in the registry key HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\dmio\Boot Info\Primary Disk Group\Name.

The next created or imported disks are added to the same disk group. The group exists as long as at least one of its members exists. Once the last dynamic disk is disconnected or converted to basic, the

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group is discontinued, though its name is kept in the above registry key. In case a dynamic disk is created or connected again, a disk group with an incremental name is created.

When moved to another machine, a disk group is considered as foreign (p. 86) and cannot be used until imported into the existing disk group. The import updates the configuration data on both the local and the foreign disks so that they form a single entity. A foreign group is imported as is (will have the original name) if no disk group exists on the machine.

For more information about disk groups please refer to the following Microsoft knowledge base article:

222189 Description of Disk Groups in Windows Disk Management
http://support.microsoft.com/kb/222189/EN-US/

Disk type

The type of disk, which is determined by the way the disk is organized.

A disk has one of two types: basic disk (p. 81) or dynamic disk (p. 84).

Drive

A physical device for accessing information on a disk (p. 83).

Examples of drives include hard disk drives (p. 87) and floppy disk drives.

Drive letter

See Volume letter (p. 92).

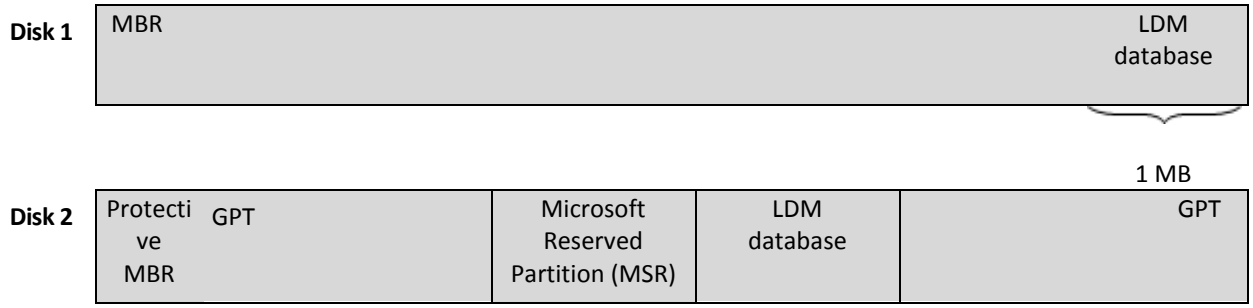
Dynamic disk

A hard disk that is managed by Logical Disk Manager (LDM), which is available in Windows starting with Windows 2000.

Use of LDM helps to flexibly allocate volumes on a disk for fault tolerance, better performance or larger volume size.

A dynamic disk can use either the master boot record (MBR) or GUID partition table (GPT) partitioning scheme (p. 89).

Each dynamic disk has a hidden database where the LDM stores the configuration of all dynamic volumes existing in the disk group, which makes for better storage reliability. On an MBR disk, this database occupies the last 1 MB of the disk. On a GPT disk, Windows creates the dedicated LDM Metadata partition, taking space from the Microsoft Reserved Partition (MSR.)



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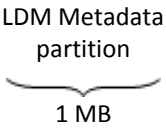

A dynamic MBR disk (Disk 1) and a dynamic GPT disk (Disk 2).

For more information about dynamic disks please refer to the following Microsoft knowledge base articles:

Disk Management (Windows XP Professional Resource Kit) http://technet.microsoft.com/en-us/library/bb457110.aspx

816307 Best practices for using dynamic disks on Windows Server 2003-based computers http://support.microsoft.com/kb/816307

Dynamic volume

A volume on one or more dynamic disks.

Dynamic volumes provide greater functionality as compared to basic volumes; but older operating systems, such as Windows 98, might not be able to work with them.

Different types of dynamic volumes suit different purposes. For example, you can:

- Increase the volume size beyond the capacity of a single disk, by using a spanned volume
- Reduce access time to files, by using a striped volume
- Achieve fault tolerance, by using a mirrored volume

For a complete list of volume types, see Volume type (p. 93).

F

Fault tolerance

The ability of a volume to ensure data integrity after a hardware failure.

Fault tolerance is usually achieved by introducing data redundancy, which enables preserving data in case one of the hard disks containing the volume fails.

Examples of fault-tolerant volumes include mirrored (p. 88) and RAID-5 volumes.

File

A set of data, such as a text document, that is stored under an identifying name—for example: Document.txt

Files are stored in a file system (p. 86) on a volume. In different file systems, files can be stored in different ways, with different file name requirements and different ways to write the full path to the file in the folder (p. 86) tree.

File system

A data structure that is used to store and manage files (p. 85) on a volume.

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A file system tracks free and occupied space, supports folders (p. 86) and file names, and stores the physical positions of files on a disk.

Examples of file systems that are supported in Windows are FAT16 (also known simply as FAT), FAT32, and NTFS.

Examples of file systems that are supported in Linux are ext2 and ext3.

When formatting (p. 86) a volume, you can choose a file system for it.

Folder

A named container for files that are stored on a volume.

A folder can contain other folders (sometimes called subfolders).

In the file system (p. 86), a folder is a table that contains a description of files (p. 85) and other folders. Such a structure allows creation of a folder tree that begins with the root folder (p. 90).

Foreign disk

A dynamic disk which is a part of a foreign dynamic disk group (p. 86).

Foreign dynamic disk group

A group of dynamic disks that is not native for the currently running operating system.

To be able to use such disks, you need to import them to the existing disk group on the machine.

Formatting

The process of creating a file system on a volume.

After the volume is formatted, you can place files and folders on it.

Fragmentation

The scattering of parts of a file across different areas of the volume.

As a result of adding, deleting, and changing files, many files can occupy space on the volume in multiple non-contiguous pieces. This requires more time to access such files.

The defragmentation (p. 83) process aims at improving access times by making fragmented files contiguous.

Free space

Space on a volume that is not occupied by data such as files and folders.

Not to be confused with unallocated space (p. 92) on a disk.

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G

GPT disk

A disk whose partitioning scheme (p. 89) is GUID partition table (GPT).

GPT disks are typically used by 64-bit operating systems, such as Windows XP Professional x64 Edition.

See also MBR disk (p. 88).

GUID partition table (GPT)

One of the two partitioning schemes of a disk. See in Partitioning scheme (p. 89).

H

Hard disk

A fixed storage media along with integrated electronics that consists of several magnetic platters that rotate synchronously on one spindle.

Hard disks have a relatively high capacity and high read/write speed.

A hard disk is also called a hard disk drive.

Hidden volume

A volume (p. 92) that is made invisible to an operating system.

Hiding a volume is usually done by changing its partition type (p. 89).

I

Initialization

The process of registering a disk in the operating system.

Initialization involves assigning a partitioning scheme (p. 89) (MBR or GPT) and a type (basic or dynamic) to the disk.

Initialization is usually performed when you add a new hard disk drive to the machine.

L

Logical drive

See Logical volume (p. 87).

Logical volume

A volume which is located on a basic MBR disk (p. 88) and is not a primary volume (p. 90).

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Logical volumes usually store user data and sometimes the files that are used by the installed operating systems.

Unlike the number of primary volumes, the number of logical volumes on the disk is unlimited.

A logical volume is also called a logical drive.

M

Machine

A physical or virtual computer uniquely identified by an operating system installation.

Main volume

Of two volumes being merged, the volume on which the other volume's files and folders will be placed.

After the two volumes are merged into one, the resulting volume has the drive letter and volume label of the main volume.

Master boot record (partitioning scheme)

One of the two partitioning schemes of a disk. See Partitioning scheme (p. 89).

Master boot record (sector)

The first sector (p. 90) on a hard disk (p. 87).

This sector usually stores information about the hard disk partitioning (p. 89). It also stores a small program that initiates the booting (p. 82) of the machine.

MBR disk

A disk whose partitioning scheme (p. 89) is master boot record (MBR).

MBR disks are typically used by 32-bit operating systems, such as Windows XP Professional.

Media builder

A dedicated tool for creating bootable media.

Mirror

Each of the two portions of disk space that make up a mirrored volume (p. 88).

Each mirror occupies a separate hard disk.

Both mirrors are identical in size and content, which ensures fault tolerance in case a hard disk with one of the mirrors fails.

The operation of converting a simple volume (p. 90) to mirrored is called adding a mirror.

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Mirrored volume

A fault-tolerant volume whose data is duplicated on two physical disks (p. 90).

Each of the two parts of a mirrored volume is called a mirror.

All of the data on one disk is copied to another disk to provide data redundancy. If one of the hard disks fails, the data can still be accessed from the remaining hard disks.

Volumes that can be mirrored include the system volume (p. 91) and a boot volume (p. 82).

A mirrored volume is sometimes called a RAID-1 volume.

P

Partition type

A hexadecimal number that normally identifies the type of a volume or the volume's file system (p. 86).

For example, a partition type of 07h identifies a volume whose file system is NTFS.

By assigning a particular partition type to a volume, you can mark the volume as a hidden volume (p. 87). For example, changing the partition type of an NTFS volume to 17h makes that volume hidden.

Partitioning

The process of creating a logical structure on a hard disk (p. 87).

Partitioning usually involves creating one or more volumes (p. 92) on the disk.

Acronis Disk Director is an example of a program that can perform partitioning.

Partitioning scheme

The method of organizing volumes on a disk.

There are two partitioning schemes: master boot record (MBR) and GUID partition table (GPT). A disk whose partitioning scheme is MBR is called an MBR disk; a disk whose partitioning scheme is GPT is called a GPT disk.

The partitioning scheme determines the number of volumes that the disk can have:

- A basic MBR disk can have either four primary volumes (p. 90), or three primary volumes and an unlimited number of logical volumes (p. 87).
- A basic GPT disk can have up to 128 primary volumes.

The partitioning scheme also determines the maximum size of each volume:

- The maximum volume size on an MBR disk is 2 terabytes.
- The maximum volume size on a GPT disk is 16 exabytes (more than 16 million terabytes).

Partitioning scheme is also known as partitioning style or partition style.

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Physical disk

A disk (p. 83) that is physically a separate device. Thus, floppy disks, hard disks and CD-ROMs are physical disks.

Primary partition

See Primary volume (p. 90).

Primary volume

A volume which is located on a portion of a basic disk (p. 81) and works as if it were on a separate hard disk.

Primary volumes often store files that are necessary to start the machine or an operating system. Many operating systems can start only from a primary volume.

The number of primary volumes on the disk is limited and depends on the partitioning scheme (p. 89).

A primary volume is also called a primary partition.

R

Root folder

The folder (p. 86) where the folder tree of a file system (p. 86) begins.

Starting from the root folder, you can uniquely describe the file (p. 85) position in the folder tree by sequentially naming all the intermediate nested folders—for example: \Windows\System32\Vmm32.vxd.

In this example, the Windows folder is a subfolder of the root folder, the System32 folder is a subfolder of the Windows folder, and the Vmm32.vxd file is located in the System32 folder.

S

Sector

The smallest information unit on a disk (p. 83) that is transferred in a single read or write operation.

Usually, a sector is 512 bytes in size.

Simple volume

A volume (p. 92) that consists of disk space from a single dynamic disk (p. 84).

Physically, a simple volume can occupy more than one region of disk space, which can be logically perceived as a single contiguous region.

When you extend a simple volume to another disk, the volume becomes a spanned volume (p. 90). When you add a mirror to a simple volume, the volume becomes a mirrored volume (p. 88).

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Spanned volume

A volume that consists of disk space from two or more dynamic disks (p. 84), in portions that do not need to be equally-sized.

A spanned volume can reside on up to 32 disks.

Unlike mirrored (p. 88) and RAID-5 volumes, spanned volumes are not fault-tolerant. Unlike striped volumes (p. 91), spanned volumes do not provide faster data access.

Stripe

Each of the several equally-sized portions of disk space that make up a striped volume (p. 91) or a RAID-5 volume.

Each stripe occupies a separate hard disk.

A striped volume consists of two or more stripes. A RAID-5 volume consists of three or more stripes.

Striped volume

A volume that resides on two or more dynamic disks and whose data is evenly distributed across equally-sized portions of disk space (called stripes) on those disks.

Access to data on striped volumes is usually faster than on other types of dynamic volumes, because it can be performed simultaneously on multiple hard disks.

Unlike a mirrored volume (p. 88), a striped volume does not contain redundant information, so it is not fault-tolerant.

A striped volume is also known as a RAID-0 volume.

Swap file

A file (p. 85) that is used by an operating system to store data that does not fit in the physical memory of the machine.

Use of the swap files enables more programs to run than would otherwise be allowed by the memory limitations. The operating system unloads currently unneeded data to the swap file, and loads needed data from the swap file into memory.

A swap file is also called a paging file.

System folder

A folder that contains files that are necessary for an operating system to work.

Examples of system folders for Windows operating systems are “Program Files” and “Windows”.

System volume

The volume which contains files that are necessary for any of the installed Windows operating systems to start.

Examples of such files are: Boot.ini, Ntdetect.com, and Ntldr

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If only one Windows operating system is installed on your machine, the system volume is usually the same as the boot volume (p. 82).

If more than one Windows operating system is installed on your machine, each of these operating systems normally has its own boot volume, whereas there is still only one system volume.

In terms of volume type, the system volume can be a primary volume on a basic disk, or a simple volume on a dynamic disk.

See also boot volume (p. 82).

T

Track

Any one of the concentric circles to which a hard disk (p. 87) is divided.

Information from one track can be accessed without moving the magnetic head.

U

Unallocated space

Space on a disk that is available for creating a new volume or a part of it, or for extending an existing volume.

Not to be confused with free space (p. 86) on a volume.

V

Volume

An independent area of storage on a hard disk (p. 87).

Typically, a volume contains a file system (p. 86), which is used to store files and folders.

A disk can store more than one volume. Some volumes, such as spanned volumes (p. 90), can reside on more than one disk.

Volume label

An optional name that can be assigned to a volume (p. 92) to simplify its identification by the user.

The length of a volume label depends on the volume's file system (p. 86). For example, the NTFS file system allows volume labels of up to 32 characters.

Some file systems, such as FAT16 and FAT32, do not allow certain characters in a volume label—for example, a colon (:) or a quotation mark (").

Volume letter

A letter, such as C, that a Windows operating system assigns to a volume to locate files and folders that are stored on it.

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A volume letter is usually assigned when you format the volume. It can be assigned, changed, or removed later without affecting the volume's data.

A volume letter is also called a drive letter.

Volume type

The type of volume, which is determined by the volume structure and by the type of disk on which the volume resides.

The following is the list of volume types with short descriptions:

- Basic volume (p. 81): A volume on a basic disk. Can be one of the following types:
  - Primary volume (p. 90): Can store information needed to start the machine or an operating system
  - Logical volume (p. 87): Usually stores user files and operation system data
- Dynamic volume (p. 85): A volume on one or more dynamic disks. Can be one of the following types:
  - Simple volume (p. 90): Occupies a single disk.
  - Spanned volume (p. 90): Occupies two or more disks in arbitrarily-sized portions.
  - Striped volume (p. 91): Occupies two or more disks in equally-sized portions. Can provide faster data access.
  - Mirrored volume (p. 88): Occupies two disks in two identical portions (mirrors). Fault-tolerant.
  - RAID-5 volume: Occupies three or more disks in equally-sized portions. Fault-tolerant.

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